ECO101: Introduction to Microeconomics
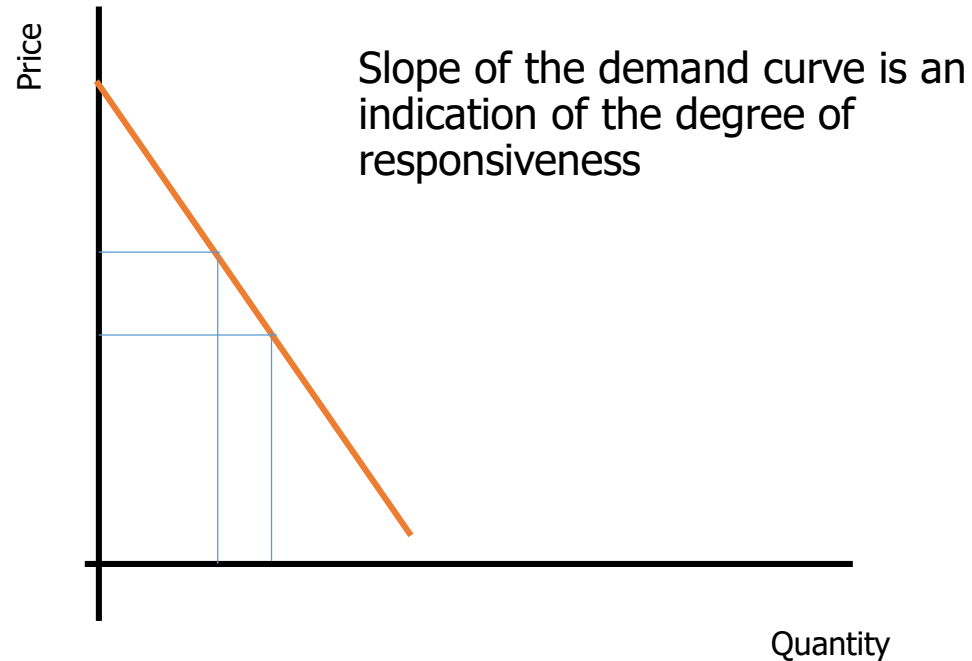
Lectures 6-7

Elasticity

- Analyzes how much buyers and sellers respond to changes in a market
- For some goods, when price changes, quantity demanded changes drastically
- For others, when price changes, quantity demanded barely changes
- Can you think of some examples?

Price Elasticity of Demand

- Law of demand: when price of a good/service rises, there is a decrease in the quantity demanded for the good/service (direction: inverse relationship)

- By how much does the quantity demanded decrease (magnitude)?

- This depends on the responsiveness/elasticity of the quantity demanded to a change in price.
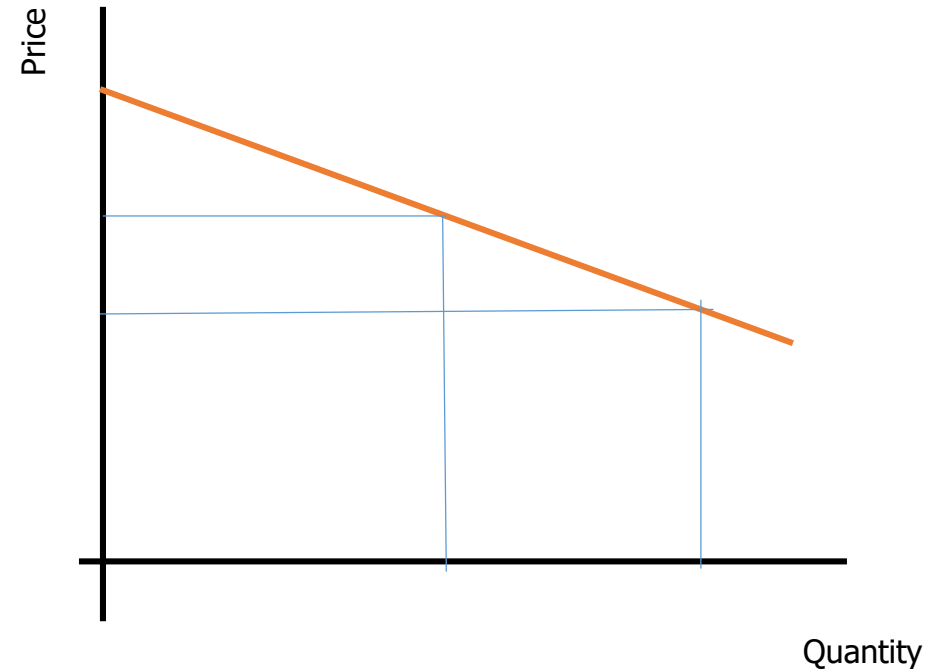
Price

30 — — — — — — — —

25 — — — — — — — — — —

D1

150   200   Quantity
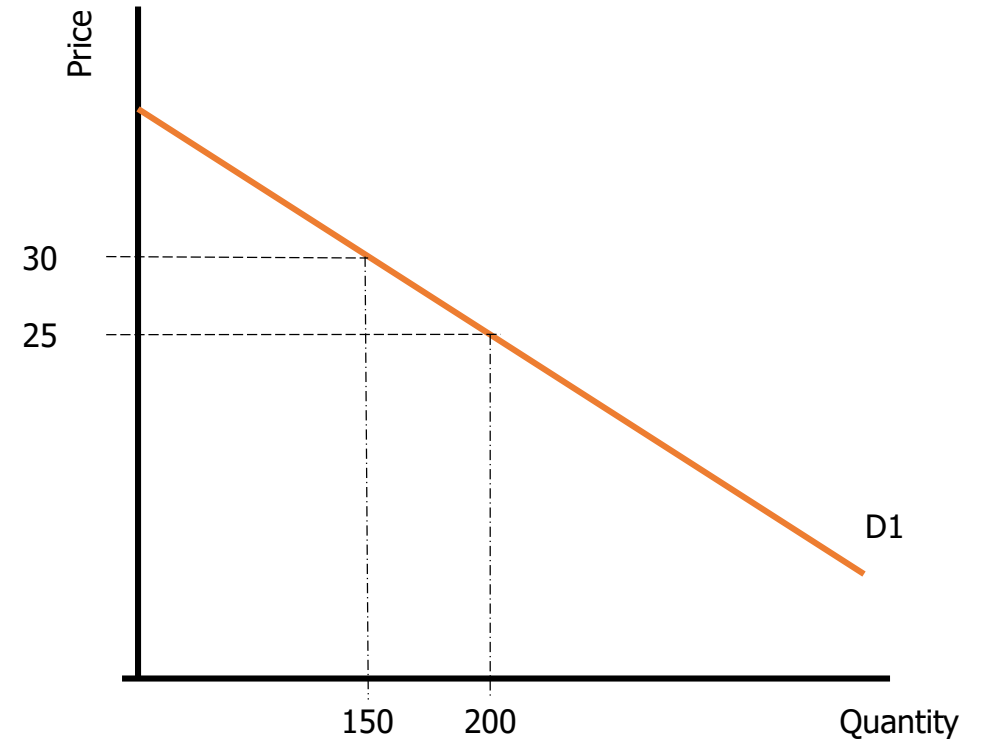
Price Elasticity of Demand

Slope of the demand curve is an indication of the degree of responsiveness

Slope of Demand Curve: Steep

If price changes, quantity demanded barely changes

A case of inelastic demand

Slope of Demand Curve: Flat

If price changes, quantity demanded changes by a lot

A case of highly elastic demand

Price Elasticity of Demand

➢ Price elasticity of demand is a units-free measure of the responsiveness of the quantity demanded of a good to a change in its price, all other things remaining the same.

$$Price\ elastiticy\ of\ demand\ (\varepsilon) = \frac{Percentage\ change\ in\ quantity\ demanded}{Percentage\ change\ in\ price} = \frac{\Delta Q/Q_{AVE}}{\Delta P/P_{AVE}}$$

➢ Epsilon (ε) is used to represent price elasticity of demand.

➢ We express the changes in price and quantity as percentages of the average price and average quantity. By using the average price and average quantity, we calculate the elasticity at a point on the demand curve midway between the original point and the new point. This means we get the same elasticity regardless of whether price falls from P1 to P2 or rises from P2 to P1.

➢ Since price and quantity demanded have an inverse relationship, the PED is always a negative number. Since we are only interested in the magnitude of the PED, we ignore the minus sign.

Calculating PED

Calculate the PED for smoothies when price falls from £3.10 per smoothie to £2.90 per smoothie and quantity demanded rises from 9 to 11 smoothies an hour.

$$\text{PED} = \frac{\%\Delta Q}{\%\Delta P} = \frac{\Delta Q/Q_{AVE}}{\Delta P/P_{AVE}}$$

$$= \frac{2/10}{0.20/3.00}$$

$$= 3$$

Calculating the Elasticity of Demand
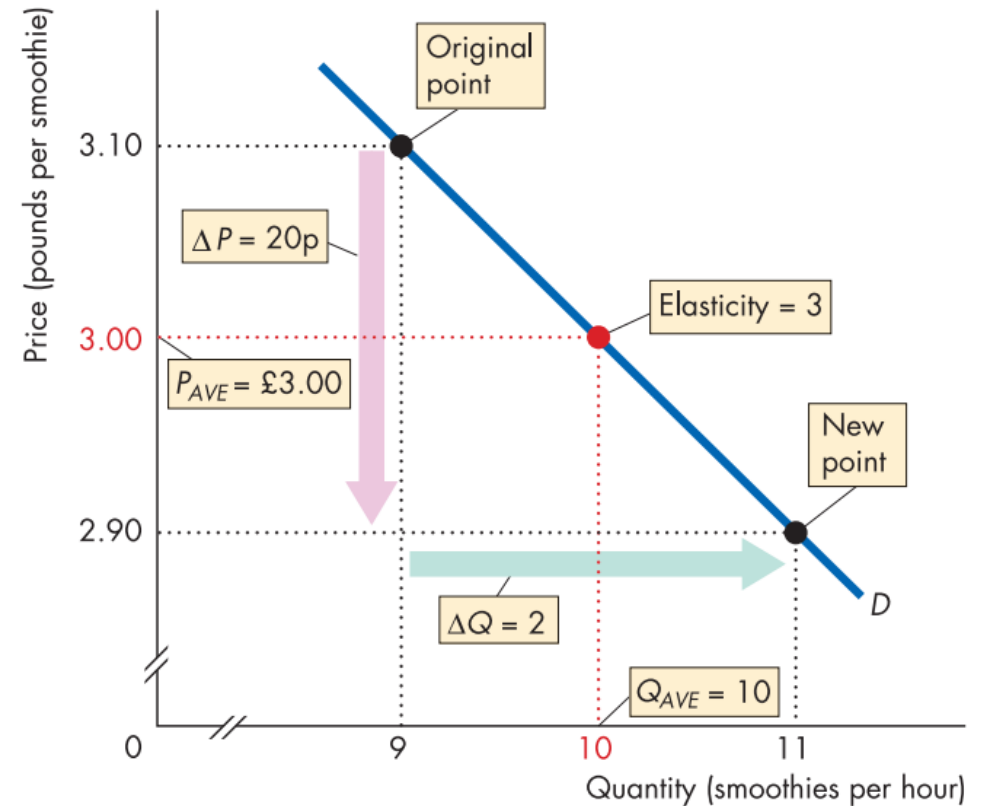
Different types of demand curves

1. PED = 0 : Perfectly Inelastic Demand

If quantity demanded remains unchanged when the price changes, the good is said to have a perfectly inelastic demand.

e.g. insulin (essential goods)

2. PED = - 1 : Unit Elastic Demand

If the percentage change in the quantity demanded equals the percentage change in price, the good is said to have a unit elastic demand.

3. 0 > PED > - 1 : Inelastic Demand

Quantity demanded does not respond strongly to changes in price so the percentage change in quantity demanded is less than the percentage change in price.

e.g. food and housing

Different types of demand curves

4. PED < - 1 : Elastic Demand

Quantity demanded responds strongly to changes in price so the percentage change in quantity demanded is greater than the percentage change in price.
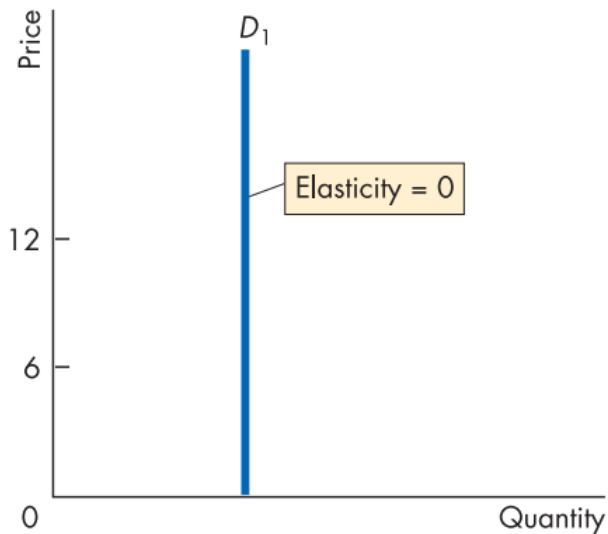
e.g. cars and furniture

5. PED = - ∞ : Perfectly Elastic Demand

If the quantity demanded changes by an infinitely large percentage in response to a tiny price change, the good is said to have a perfectly inelastic demand.
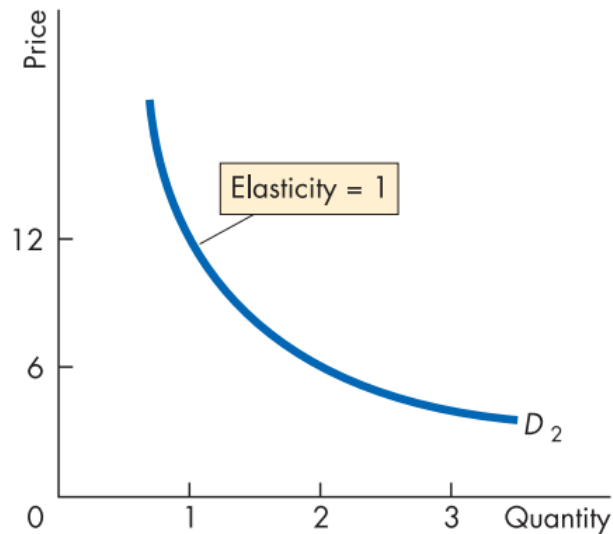
e.g. brands of cereal (goods that have perfect substitutes)

Different types of demand curves

Inelastic and Elastic Demand

(a) Perfectly inelastic demand

Price

D_1

Elasticity = 0

12

6

0   Quantity

(b) Unit elastic demand

Price

Elasticity = 1

12

6

D_2

0   1   2   3   Quantity

(c) Perfectly elastic demand

Price

Elasticity = ∞

12 D_3

6

0   Quantity
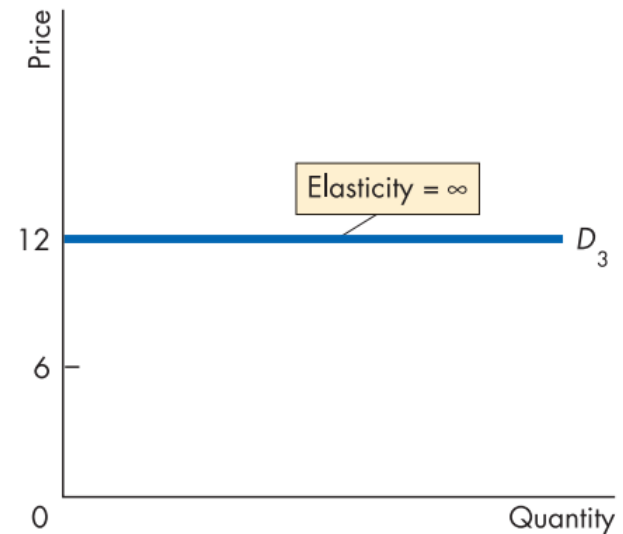
Factors influencing Price Elasticity of Demand

1. The closeness of substitutes

The closer the substitutes for a good/service, the more elastic the demand for it.

Necessities such as food and insulin have poor alternatives and thus have an inelastic demand. Luxurious goods such as cars and vacations have an elastic demand.

2. Proportion of income spent on the good

Other things remaining the same, the greater the proportion of income spent on a good, the more elastic is the demand for it.

For goods that use up a large proportion of our income and budget, a small price change can make them unaffordable e.g. housing rent

Factors influencing Price Elasticity of Demand

3. The time elapsed since a price change

The longer the time that has elapsed since a price change, the more elastic is demand. The more time consumers have to adjust to a price change, the more elastic is the demand for that good.

Elasticity along a linear demand curve

Figure shows how the elasticity of demand changes along a linear demand curve.
➢ Demand is unit elastic at the mid-point of the demand curve i.e. elasticity = 1
➢ At prices above the mid-point, demand is elastic
    i.e. elasticity > 1
➢ At prices below the mid-point, demand is inelastic
    i.e. elasticity < 1

Elasticity Along a Linear Demand Curve
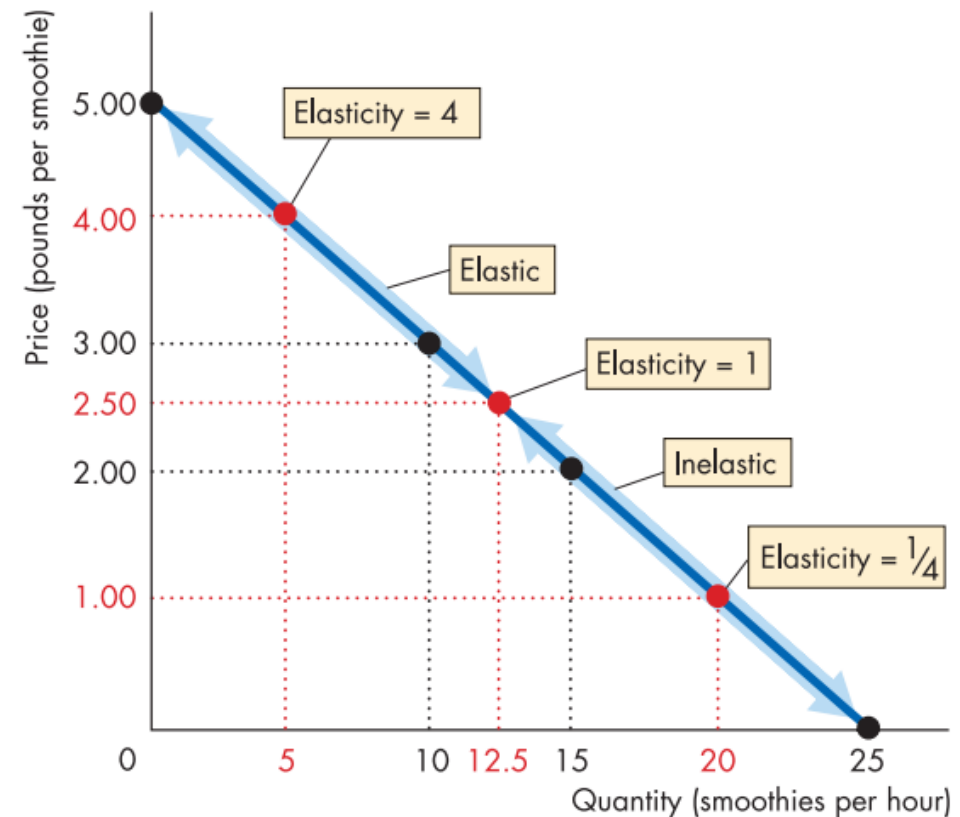
Why do firms care about PED?

➢ A rise in price causes quantity demanded to decrease (law of demand)

➢ Does a rise in price cause total revenue earned by a firm to increase?

➢ Total Revenue = Price X Quantity Sold

➢ Change in revenue depends on the elasticity of demand

Suppose a hair stylist is considering increasing the price of haircuts from $25 to $35. At $25 per haircut, the stylist usually sells 15 haircuts in one day. With the new price, she will end up losing a few clients – but will she still be earning more?

Why do firms care about PED?

Change in total revenue due to a change in price depends on the elasticity of demand

If demand is elastic, a 1 percent price increase reduces quantity demanded (and thus the quantity sold) by more than 1 percent, and total revenue decreases.

If demand is inelastic, a 1 percent price increase reduces quantity demanded (and thus the quantity sold) by less than 1 percent, and total revenue increases.

If demand is unit elastic, a 1 percent price increase changes the quantity sold by 1 percent and the revenue remains unchanged.

Why do firms care about PED?

Changes in total revenue as a rest of changes in price, when all other influences on quantity sold remains unchanged, can be used to estimate the price elasticity of demand – this is known as the total revenue test.

If the number of haircuts sold in a day decreases from 15 to 10 when the hair stylist increases prices per haircut from $25 to $35, then the demand for haircuts must be:

a. Elastic

b. Inelastic

Income Elasticity of Demand

If income increases, demand for some goods & services goes up. By how much?

Depends on income elasticity of demand

Income elasticity of demand is a measure of the responsiveness of the demand for a good or service to a change in income, other things remaining the same.

$$Income\ elastiticy\ of\ demand = \frac{Percentage\ change\ in\ quantity\ demanded}{Percentage\ change\ in\ income} = \frac{\Delta Q / Q_{AVE}}{\Delta I / I_{AVE}}$$

If income elasticity of demand is positive: good is normal

If income elasticity of demand is negative: good is inferior

Income Elasticity of Demand

If normal goods have

Income elasticity of demand > 1: As income increases, the quantity demanded increases faster than income i.e. luxury goods such as international travel, jewelry

Income elasticity of demand < 1: As income increases, the quantity demanded increases slower than income i.e. necessity goods such as newspapers, clothing

As you get richer, you spend a larger proportion of your income on luxury goods and a smaller proportion of your income on necessary goods.

Cross Elasticity of Demand

Cross price elasticity of demand is a measure of the responsiveness of the demand for a good or service to a change in the price of a substitute or complement, other things remaining the same.

$$Cross\ elastiticy\ of\ demand = \frac{Percentage\ change\ in\ quantity\ demanded\ of\ good\ X}{Percentage\ change\ in\ price\ of\ good\ Y}$$

$$= \frac{\Delta Q_X / Q_{XAVE}}{\Delta P_Y / P_{YAVE}}$$

If cross elasticity of demand is positive: goods are substitutes

If cross elasticity of demand is negative: good are complements

Cross Elasticity of Demand

The magnitude of cross elasticity of demand depends on the strength of the relationship between the two goods.

In case of substitutes:

If XED > 1: high elasticity because the two goods are very close substitutes e.g. coke and pepsi

If XED < 1: low elasticity the two goods are weak substitutes e.g. burgers and pizzas

In case of complements:

If XED < - 1: high elasticity because the two goods are very close complements e.g. pencil and sharpener

If XED > - 1: low elasticity because the two goods are weak complements e.g. tea and milk

If goods are unrelated: XED = 0 e.g. TVs and shirts

Price Elasticity of Supply

Price elasticity of supply is a measure of the responsiveness of the quantity supplied to a change in the price of a good when all other influences on selling plans remain the same.

$$Price\ elastiticy\ of\ supply = \frac{Percentage\ change\ in\ quantity\ supplied}{Percentage\ change\ in\ price} = \frac{\Delta Q / Q_{AVE}}{\Delta P / P_{AVE}}$$

Since price and quantity supplied have a positive relationship (law of supply), the PES is always a positive number.

Factors affecting PES

1. Resource Substitutability

If a good can only be produced by using rare or unique resources or resources that are not easily available, it will have a low elasticity of supply i.e. the good will have a low responsiveness to price changes.

2. Time frame

Goods that take a long time to produce have a very low price elasticity of supply. On the other hand, goods that can be quickly and easily made have high elasticity of supply.

In the long run, supply is more elastic.

Example

1. Good weather brings a bumper tomato crop. The price falls from £7 to £5 a load, and the quantity demanded increases from 300 to 500 loads a day. Over this price range,

a. What is the price elasticity of demand?

b. Describe the demand for tomatoes.

2. Judy's income has increased from £13,000 to £17,000. Judy increased her demand for concert tickets by 15 per cent and decreased her demand for bus rides by 10 per cent. Calculate Judy's income elasticity of demand for

a. concert tickets

b. bus rides

Example

3. A fall in the price of X from $12 to $8 causes an increase in the quantity demanded of X from 500 to 700 units and quantity demanded of Y from 900 to 1,100 units.

a. What is the cross elasticity of demand between X and Y?

b. What is the relationship between goods X and Y?

Example

4. The demand function for an energy drink on an exam day is given by

$$P = 130 - 2Qd$$

    a.   Assume you sell one litre of the drink at Tk 50. What is your total revenue earned?

    b.   Hoping to make more profits, you decide to increase the price to TK 60 per litre. How does your total revenue change?

    c.   Over this price range, what is the PED for the energy drink?