Catholic Junior College
H2 ECONOMICS (9570)
THEME 2: MARKETS

2.1 Price Mechanism & Its Applications

2.1.1 Price Mechanism and its Applications
2.1.2 Demand and Supply Analysis and its Applications

Enduring Understanding

- The price mechanism is one way in which producers and consumers respond to price signals and "make choices" to achieve efficient resource allocation.

Essential Questions

- How are prices and quantities of goods and services in free markets determined?
- Why would the government want to intervene in the free market?

Unit Summary

In the previous topic, we learnt that the central economic problem is scarcity, which arises out of the conflict between unlimited wants and limited resources. This results in choices having to be made by economic agents, in order to maximise their welfare. Different societies will use different systems, i.e. free market, mixed or command economy, to allocate their scarce resources.

In this unit, we will learn about how prices are determined in a free market through demand and supply forces, i.e. the price mechanism, and how the price mechanism can allocate resources efficiently, thereby addressing the three fundamental questions. We will also examine the need for government intervention in situations where free market outcomes are undesirable.

In summary, we learnt that scarcity is the reason <u>why</u> there is a need to allocate resources. In this topic, we are going to learn about <u>how</u> scarce resources are allocated in competitive markets.

CONTENT

12   Limitations with the use of elasticity concepts

GLOSSARY OF MAJOR KEY TERMS

FOOD FOR THOUGHT – **PAST-YEAR A-LEVEL QUESTIONS**

APPENDIX:
Article 1: Rolex demand hotter than at any time in the past 30 years says Govberg
Article 2: Why Are Oil Prices Dropping Sharply? Global Economy Forecasts Lowered

REFERENCES:
1.   Sloman, J. & Wride, A. (2014), *Economics,* 9th Edition, Chapter 2
2.   Mankiw, G., Quah, E & Wilson, P (2008), *Principles of Economics: An Asian Edition*, Chapter 4 & 6
3.   Tan, ST, et. al. (2008), *Economics in Public Policies – The Singapore Story*, Chapter   2, pg 33-37 & pg 171-192
4.   Krugman, P., Wells, R., Ray, M., & Anderson, D. (2011). *Microeconomics in Modules* (2nd ed.). Worth.

H2 Economics Syllabus Requirement

Use this checklist to check that you mastered the following concepts:

2.1.1 Price Mechanism and its Functions	✓
a. How the price mechanism allocates scarce resources in the freemarket through signalling, incentive and rationing functions	
2.1.2 Demand and Supply Analysis and its Applications	
a. Market demand as a summation of individual demand	
b. Market supply as a summation of individual supply	
c. Changes in price of the good/service itself cause a movement along the demand/supply curve	
d. Changes in non-price determinants and how they cause shifts in the demand/supply curve	
e. The equilibrium market price and quantity are determined by the interaction of demand and supply	
f. Changes in demand and supply can affect equilibrium price and quantity, consumer expenditure, producer revenue, consumer surplus and producer surplus	
g. These outcomes can be affected by price elasticities of demand and supply, income and cross elasticities of demand	
h. Application of demand & supply analysis to real-world markets, including labour, is required	
2.1.3 Government Intervention in Markets	
a. Governments may intervene in markets in the form of taxes, subsidies, price controls (maximum and minimum prices) and quantity controls (quotas)	
b. Government intervention in markets can affect the equilibrium price and quantity, consumer expenditure and producer revenue, consumer surplus and producer surplus	
c. Impact of government intervention on markets may be affected by price elasticities of demand and supply	
Concepts and Tools of Analysis	

• Price mechanism
• Ceteris paribus
• Demand and its determinants
• Change in demand versus change in quantity demanded
• Supply and its determinants
• Change in supply versus change in quantity supplied
• Market equilibrium
   – Equilibrium price and quantity
• Market disequilibrium
   – Shortage and surplus	

- Price elasticity of demand
- Income elasticity of demand
    – Normal and inferior goods
- Cross elasticity of demand
    – Complements and substitutes
- Price elasticity of supply
- Consumer expenditure and producer revenue
- Consumer surplus and producer surplus
- Taxes and subsidies
- Price controls
    – Maximum and minimum prices
- Quantity controls
    – Quotas

Conceptual Outline

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Central Problem of Economics
            │
            ▼
3 Basic Economic Questions
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What & How Much to Produce	How to Produce	For Whom to Produce

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            Price Mechanism
         Assumption: Ceteris Paribus
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Theory of Demand (Consumers)		Theory of Supply (Producers)

Price Determinant	Non-Price Determinant	Price Determinant	Non-Price Determinant

Non-Price Determinant (Demand):
- Income of Consumers (Income elasticity of Demand)
- Price of Related Goods (Cross Elasticity of Demand)
- Consumers' Taste and Preference
- Consumers' Expectations
- Ease & Cost of Borrowing
- Size & Composition of Population
- Government Policies

Non-Price Determinant (Supply):
- Price & availability of Factor Inputs
- State of Technology
- Price of Related Goods
- Seasonal Factors
- Government Policies
- Producers' Expectations

Δ in Qd

Δ in DD

Δ in Qs

Δ in SS

Movement along DD Curve	Leftwards or Rightwards *Shift* of DD Curve	*Movement* along SS Curve	Leftwards or Rightwards *Shift* of SS Curve

Market Equilibrium (Theory of Price Determination)

CONCEPTUAL OUTLINE OF ELASTICITIES OF DEMAND & SUPPLY

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                    │  Concepts of Elasticity   │
                    └──────────────────────────┘
                                 │
          ┌──────────────────────┴──────────────────────┐
┌──────────────────────────┐                             │
│  Elasticity of Demand     │                             │
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│ Price  │ │ Income │ │ Cross  │      │ Price Elasticity of Supply │
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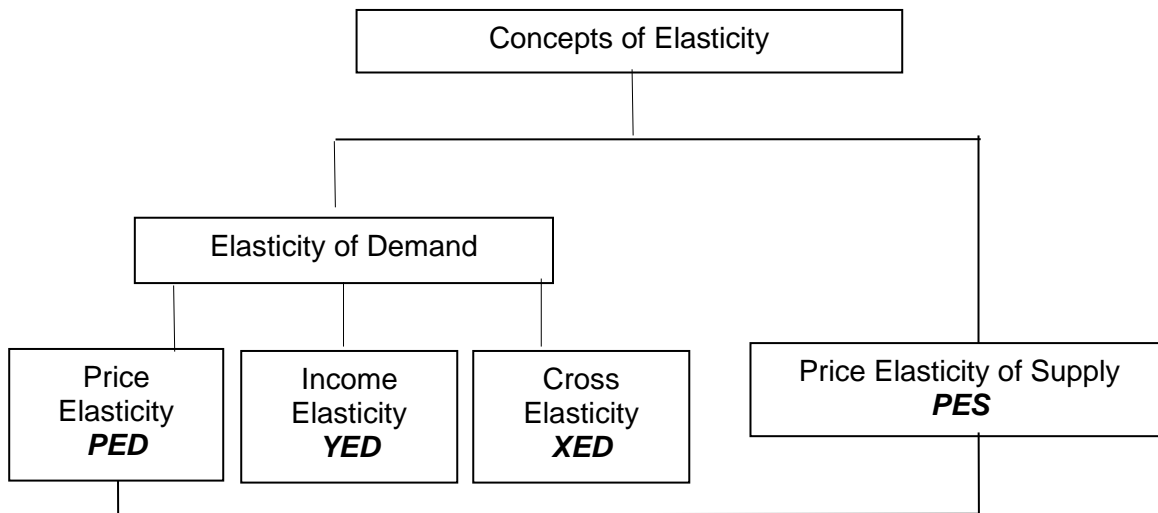
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            ┌──────────────────────────────┐
            │ Definition, Formula, Sign     │
            └──────────────────────────────┘
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            │          Degrees              │
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            ┌──────────────────────────────┐
            │        Determinants           │
            └──────────────────────────────┘
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            │         Application           │
            └──────────────────────────────┘
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Handwritten annotations:

Normal Good

$0 < YED < 1$

$1 < YED < \infty$

YED

$\oplus$

Normal Good
↑Y D↑
↓Y D↓

Inferior Good
↑Y D↓
↓Y D↑

Necessities
$0 < YED < 1$

Luxury Good
$1 < YED < \infty$

1   Introduction to Price Mechanism

1.1   Price Mechanism

Definition:
The use of price signals to allocate scarce resources among competing uses is known as the <u>Price Mechanism</u>.

The Price Mechanism helps to answer the three fundamental questions in Economics (**What** and how much to produce, **How** to produce and **For Whom** to produce), as mentioned in the previous chapter.

Some believe that in a free-market economy, as economic agents pursue their self-interests, resources will be allocated in society's best interest.

To understand how the free-market economy uses the price mechanism to allocate resources, we will first need to understand how prices are determined in a free market economy.

1.2   Price Determination

Prices are determined by the interaction of demand and supply (Theory of Demand and Supply).

Theory of <u>Demand</u> and <u>Supply</u>

Explains the behaviour of **consumers**	Explains the behaviour of **producers/suppliers**
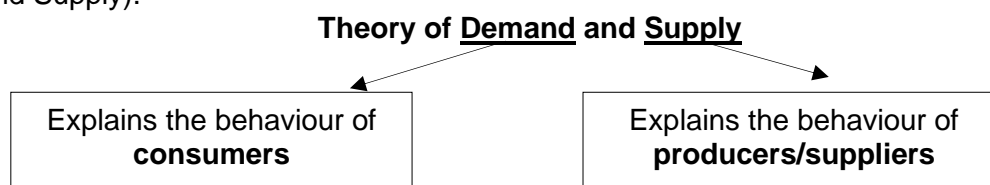
The interaction of demand and supply will determine prices, which in turn provide signals on how scarce resources should be allocated efficiently in free market economies.

2 Theory of Demand

2.1 Definition of Demand and Quantity Demanded

Definition:
Demand is defined as the <u>amount</u> of a good or service that consumers are both <u>willing</u> and <u>able</u> to buy at <u>each possible price</u> in a given period of time, <u>ceteris paribus</u>.

The theory assumes that every consumers are **rational** in their purchase of goods and services so as to maximise their total utility (satisfaction).

Ceteris paribus refers to the assumption that every other variable that affects the demand of a good or service (e.g. income, consumer tastes and preferences, price expectations, etc.) remains constant.

Definitions:	
Quantity demanded refers to a particular quantity that the consumer is willing and able to buy at a particular price, as reflected by a <u>point</u> on a given demand curve.	**Demand** refers to quantity demanded at <u>every price</u>, i.e. the relationship between price and quantity demanded, as represented by the entire demand schedule or demand <u>curve.</u>

2.2 The Law of Demand

Definition:
The law of demand states that in a given time period, the <u>quantity demanded</u> of a product is <u>inversely related</u> to its price, ceteris paribus.

Note: The law of demand refers to the inverse relationship between price and '*quantity demanded*' – not '*demand*'. The difference between '*quantity demanded*' and '*demand'* will be made clearer in Section 2.5.

The **higher** the price of a good or service, ceteris paribus, the **less** willing and able consumers are to buy the good or service, and hence the **smaller** the **quantity demanded** of it.

Similarly, the **lower** the price of a good or service, ceteris paribus, the **more** willing and able consumers are to buy the good or service, and hence the **greater** the **quantity demanded** of it.

2.2.1   Reasons for the Law of Demand – The Law of Diminishing Marginal Utility

As seen from the **Law of Demand**, the **quantity demanded** of a good or service is inversely related to its price. This inverse relationship between price and quantity demanded can be explained through the **Law of Diminishing Marginal Utility**.

Utility is the satisfaction (benefit) that people get from consuming a good or service. *Marginal* utility is the *additional* satisfaction (benefit) that consumers derive from consuming an additional unit of a good.

Definition:
The Law of Diminishing Marginal Utility (LDMU) states that beyond a certain point of consumption, as more and more units of a good or service are consumed, the additional utility derived from each additional unit consumed will fall.

The reason behind why marginal utility decreases with each additional unit consumed can be easily understood using a simple example:
- After a P.E. lesson, you may be extremely thirsty and enjoy the first glass of water very much. Subsequently, each additional glass of water consumed will provide less additional satisfaction than the previous glass of water (marginal utility diminishes).

Based on the **Marginalist Principle**, when consumers purchase an additional unit of a good, they will consider if the *marginal utility* (marginal benefit) that they derive from the additional unit is worth the ***price*** (marginal cost) that they have to pay. To maximise

utility, consumers will purchase an additional unit until the marginal benefit equates to marginal cost (MB = MC). Therefore, for individual demand:

Price (Marginal Cost) = Marginal Benefit

Since marginal benefit falls with more and more units consumed based on LDMU, the price that consumers are willing to pay for the next unit also falls as the number of units consumed increases. This explains the **inverse relationship between price and quantity demanded**, and the **downward-sloping demand curve**.

2.3   Individual Demand Schedule and Curve

Definition:
Individual demand is the demand of one consumer.

The individual's demand can be represented in the form of a table known as a **demand schedule**:

Price ($) per packet	Quantity (Packets of Coffee)
1	16
2	14
3	12
4	8
5	5
6	2

Table 1: Cindy's Individual Demand Schedule

The demand schedule represents the relationship between price and quantity demanded in a table. It shows the various amounts of a product that a consumer is willing and able to buy at each specific price during a given time period.

Individual demand can also be expressed in the form of **demand curve**.

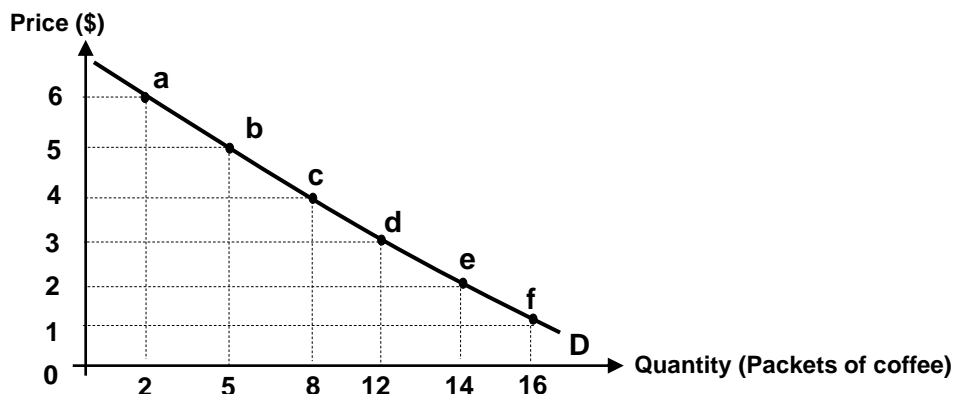The demand schedule in Table 1 appears as a demand curve in Figure 1.

Figure 1: Cindy's Individual Demand Curve

The price ($ per unit) is shown on the vertical axis and the quantity of the product - in this case packets of coffee demanded is shown on the horizontal axis.

Each combination of price and quantity demanded listed in the demand schedule in Table 1 is a point on the demand curve in Figure 1. Point **a** indicates that if the price of a packet of coffee is $6, Cindy will buy 2 packets of coffee.

The demand curve slopes downwards, reflecting the **Law of Demand** (i.e. price and quantity demanded are inversely related).

2.4   Market Demand Schedule and Curve

Definition:
Market demand is the sum of the individual demands of all consumers in the market.

The market demand is derived by summing up the quantity demanded by all consumers in the market at every given price (i.e. horizontal summation).

Refer to Table 2, let us assume that the market for coffee has only two buyers – Benny and Cindy.

To obtain the market demand for coffee, we have to add the quantity demanded by each buyer at each price. For example, at the price of $1, quantity demanded by Benny is 12 packets of coffee while that by Cindy is 16 packets. The total quantity demanded for coffee by the market at the price of $1 is the sum of the two, 28.

Fill in the quantity demanded for coffee by the market at all prices in Table 2 below.

Price ($) per packet	Quantity (Packets of Coffee)		
	Benny	**Cindy**	**Market Demand**
1	12	16	28
2	10	14	
3	8	12	
4	6	8	
5	4	5	
6	1	2	

Table 2: Derivation of Market Demand Schedule

Graphically, the **horizontal summation** of individual demand curves gives the market demand curve as shown in Figure 2 below. The quantity demanded by the market (24 units) at $2 is the sum of the quantities demanded by Benny (10 units) and the quantities demanded by Cindy (14 units) at this price.

The quantities demanded by the market at all other prices are obtained in the same way. Fill in the empty boxes below to indicate the correct <u>market</u> quantity demanded at the corresponding price.
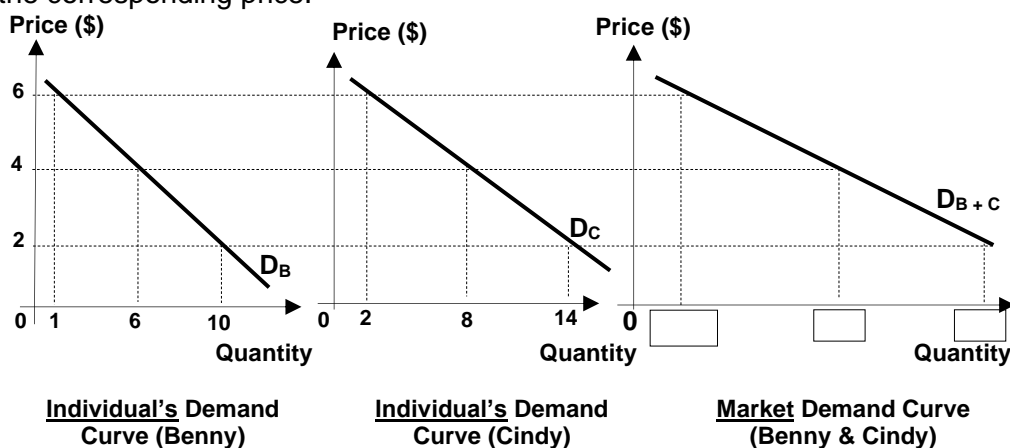
Figure 2: Derivation of Market Demand Curve for Coffee
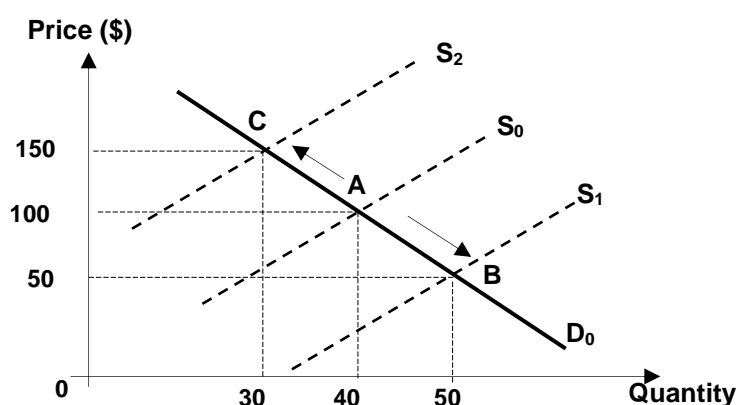
Figure 3: Changes in *Quantity Demanded* of bicycles

In general, the word "demand" refers to <u>market demand</u> of a good or service unless stated otherwise.

2.5   Change in Quantity Demanded vs Change In Demand

IMPORTANT

A **change in <u>Demand</u>** is due to **changes in <u>non-price</u> determinants** and is **represented by a <u>shift of the demand curve.</u>**	A **change in <u>Quantity Demanded</u>** is caused by **changes in <u>price</u>** and is **represented by a <u>movement along the demand curve</u>**.

2.5.1 Change in Quantity Demanded (Price Determinant)

When changes in the <u>price</u> of a good or service cause consumers to adjust the <u>quantity</u> purchased, economists say that there has been a <u>change in quantity demanded</u> of the good or service.

Diagrammatically, such a change is illustrated by a **movement along the demand curve** of the good or service as shown in Figure 3.

A fall in price from $100 to $50, leads to an **increase in quantity demanded** of bicycles from 40 to 50 units. This is represented by a **downward movement** along the demand curve from Point A to Point B.

Conversely, a **rise in price** from $100 to $150 will lead to a **decrease in quantity demanded** of bicycles from 40 to 30 units. This is represented by an **upward movement** along the demand curve from Point A to Point C.

Note: In Figure 3, changes in price are assumed to be caused by changes in supply (represented by the upward sloping supply curves), which will be explored later in the unit.

2.5.2 Change in Demand (Non-Price Determinant)

Demand changes only when there are changes to factors **NOT** relating to the price of the good or service itself, but by **NON-PRICE DETERMINANTS**.

Diagrammatically, changes in demand are illustrated by **shifts in the demand curve** of the good or service as shown in Figure 4 below.

An increase in demand is represented by the **rightward shift** of the demand curve. At each and every price, there is now an increase in quantity demanded.

E.g. **When demand increases** (shifts right from D_0 to D_2), the **quantity demanded increases at every price.** To illustrate, at the same price of P_0, quantity demanded increases from Q_0 to Q_2. The same is true for all other prices.

A decrease in demand is represented by the **leftward shift** of the demand curve. At each and every price, there is now a decrease in quantity demanded.
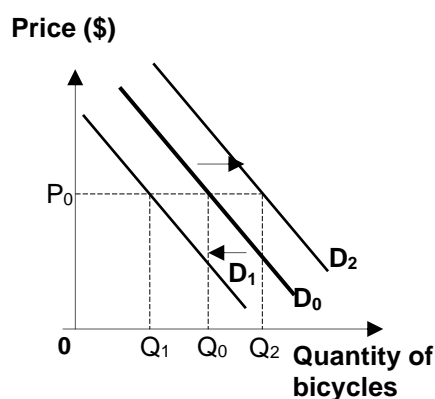
Figure 4: Changes in *Demand*

E.g. when demand decreases (shifts left from D_0 to D_1), the quantity demanded decreases at every price. To illustrate, at the same price of P_0, quantity demanded decreases from Q_0 to Q_1. The same is true for all other prices.

Self-Assessment 1:

Which of the following statements is true?

A. An increase in demand means the same as an increase in quantity demanded.
B. Price and quantity demanded are positively related.
C. An increase in quantity demanded means a movement up the demand curve.
D. An increase in demand means a movement along a given demand curve.
E. An increase in demand means that consumers will purchase more of a product at each possible price.

2.6   Non-Price Determinants of Demand

Changes in factors <u>not</u> relating to the price of the particular good or service will increase or decrease demand. These are represented by shifts of the demand curve, either to the left or to the right.

These determinants include:
- consumers' income;
- prices of related goods;
- consumers' tastes and preferences;
- consumers' expectations;
- ease and cost of borrowing;
- size and composition of population;
- seasonal factors; and
- government policies.

2.6.1   Income Elasticity of Demand (YED) (Consumers' Income)

The ability of a consumer to buy goods or services depends on the consumer's income, which may change because of changes in the level of economic activity. For example, consumers' income may change during an economic boom or a recession, due to changes in government policies, e.g. change in income tax rates or transfer payments (see note below) – and these affect consumers' disposable income.

> *Note: Disposable income (Y_d) refers to income after deducting income taxes and adding benefits/transfer payments. Transfer payments are welfare payments made available through a country's social security system, e.g. GST vouchers or unemployment benefits.*

The demand of a good can vary directly or inversely with levels of income. This depends on the **income elasticity of demand (YED).**

2.6.1.1 Definition and Formula of YED

> **Definition:** The income elasticity of demand (YED) measures the degree of responsiveness of ***demand*** for a good to a change in consumers' income, ceteris paribus.
>
> *Note: The change in consumers' income is the **<u>cause</u>**, while the change in demand is its **<u>effect</u>**.*
>
> *Students should use 'demand' in the definition of YED – and not 'quantity demanded' because YED measures the responsiveness of demand – not quantity demanded – to changes in the non-price factor of 'income'.*

YED helps us predict **how** the demand curve will ***shift* and by how much** in response to a given change in income.

FORMULA:

$$YED = \frac{\text{Percentage change in quantity demanded}}{\text{Percentage change in income}}$$

$$= \frac{\frac{\Delta Q}{Q} \times 100\%}{\frac{\Delta Y}{Y} \times 100\%} = \frac{\Delta Q}{\Delta Y} \times \frac{Y}{Q}$$

Where   Q = initial quantity demanded,
ΔQ = change in quantity demanded,
Y = initial income,
ΔY = change in income

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*Note: **With a change in income, demand changes and the entire demand curve shifts**. When calculating YED, we need to use two points on the two demand curves in the formula. Therefore, the formula requires the use of **quantity demanded**, i.e. it is not possible to use the whole demand curve in the calculation.*

*However, students should be clear that, conceptually, **YED measures the responsiveness of demand to a given change in income (and income is a non-price factor).***

EXAMPLE:
If a 10% increase in income results in a 34% increase in the quantity demanded for large cars, then the income elasticity of these cars would be:

$$YED = \frac{34\%}{10\%} = +3.4$$

- The positive **sign** tells us that the rise income would lead to a rise in demand for cars.
- The **value** of 3.4 implies that the demand for large cars changes more than proportionately in response to a change in the income of consumers.

2.6.1.2 Degrees of Income Elasticity of Demand

<u>Sign of YED</u>

YED may be positive or negative. The sign tells us whether the relationship between consumers' income and demand for the product is direct or inverse.

   a) Positive Income Elasticity of Demand (YED > 0)

Goods with positive YED are **normal goods**. This means that the relationship between income and demand for normal goods is **direct**, e.g. when income increases, demand for these goods increases, ceteris paribus.

<u>Magnitude of YED</u>

Under the category of normal goods that have **positive YED**, we can further categorise them into two sub-categories based on the magnitude of the YED value:

Positive YED	
i.e. normal goods where the relationship between income and demand is direct.	
i. Income inelastic demand (0<YED<1) [Necessities]	**ii. Income elastic demand (YED >1) [Luxury goods]**
Demand for goods that are **necessities** is income inelastic (0<YED<1), where a change in income will lead to a **less than proportionate change** in demand for the goods in the same direction, e.g. an increase in income will result in a *less than proportionate* increase in demand for necessities.	Demand for **luxury goods** is income elastic (YED >1), where a change in income will lead to a **more than proportionate** change in demand for the goods in the same direction, e.g. an increase in income will result in a *more than proportionate* increase in demand for luxury goods.
For example, when the YED is +0.5, an increase in income by 10% will increase the demand for the necessity by only 5%, ceteris paribus.	For example, when the YED is +5, then an increase in income by 10% will increase the demand for the luxury good by 50%, ceteris paribus.
Examples of necessities: Staple food such as rice, bread and physicians' services.	Examples of luxury goods: Jewellery, sports cars, meals at fine-dining restaurants.

b) Negative Income Elasticity of Demand (YED <0)

Goods with negative income elasticity are **inferior goods**. This means that the relationship between income and demand for inferior goods is **inverse**, e.g. when income increases, demand for inferior goods fall, ceteris paribus.

For example, when the YED is -2, then an increase in income by 10% will decrease the demand for the good by 20%, ceteris paribus.

Examples of inferior goods: Second-hand mobile phones in Singapore, imitation designer goods, house-brand supermarket products.
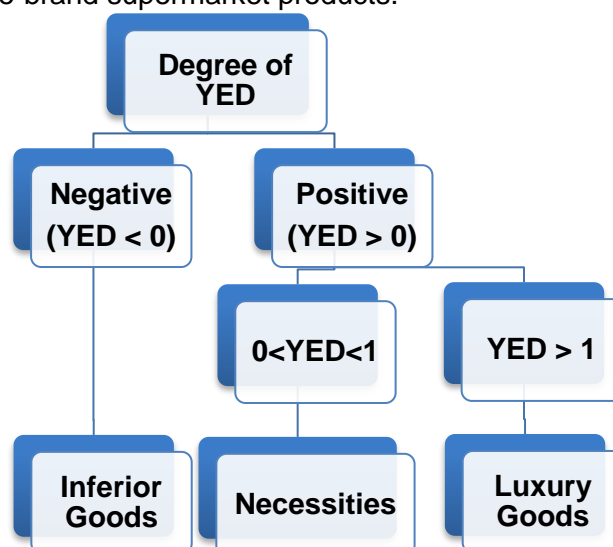
The categories above can be summarised diagrammatically below in terms of **direction** and **magnitude** of shift when there is a given <u>**increase in income**</u>.

Referring to Figure 5, assuming a given supply curve and income increases for consumers of all these goods:

i   The demand for the **necessity** good (Fig. 5a) and **luxury** goods (Fig 5b) will both increase, and their demand curves will shift to the right.

ii   However, the demand for the **luxury** good will increase by a <u>greater</u> extent as compared to that for a **necessity** good.

iii On the other hand, the demand for an **inferior** good (Fig. 5c) will fall and its demand curve will shift to the left instead.

Figure 5: Effects on the demand curve for a given increase in income
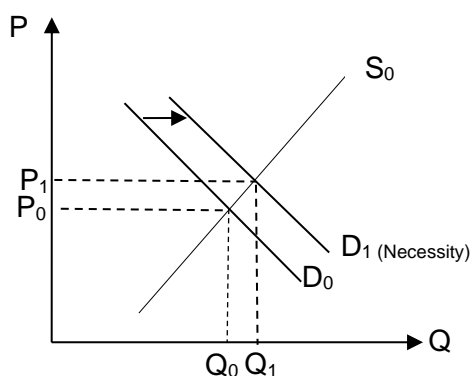
Fig 5a: Market for Bread (necessity)
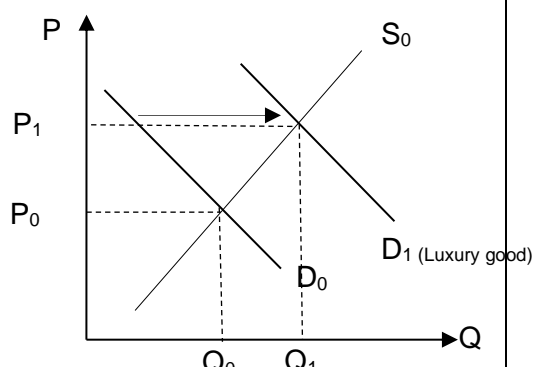
Fig 5b: Market for Jewellery (luxury)
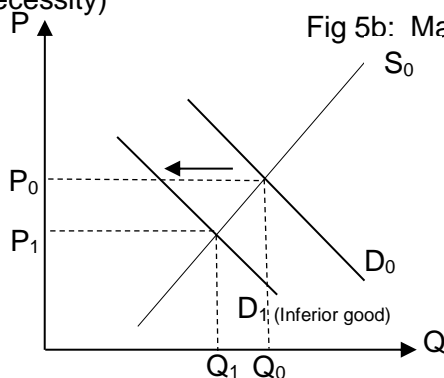
Fig 5c: Market for second-hand mobile phones in Singapore (inferior good)

Note: When analysing YED, students should first analyse the sign (i.e. positive/ negative)
before *analysing the magnitude (i.e. the value):*
- *The **<u>sign</u>** indicates the direct/ inverse relationship between income and demand, i.e. whether a change in income will change demand in the same/ different direction.*
- *The **<u>magnitude</u>** indicates the extent of the change in demand due to the change in income, i.e. income changes more/ less than proportionately in response to a given change in income.*

2.6.1.3 Determinants of YED

Differences in income elasticity is often because perceptions of the good differ from consumer to consumer. This may be due to:

1. **Stages of economic development in a country (level of income):** Research has found that what is considered as a necessity in a country may be viewed as a luxury good in another.
   - For example, poultry, as a necessity, has a YED value of +0.3 in the USA (i.e. income inelastic demand). However, in Sri Lanka, poultry is perceived as a luxury product with a YED of +2.0. This may be due to Sri Lanka's status as a developing country as compared to USA's developed nation status.
   - Another example could be how older second-hand mobile phones could be considered as inferior goods (i.e. negative YED) in more developed countries but seen as luxury goods (positive YED>1) in less developed countries.

2. **Habitual consumption habits (Degree of necessity):** There could be different income elasticities for the same product across different regions due to consumers' perceptions of the product.
   - For example, wine in France has been found to have a YED value of +0.1 while that in USA is +1.4, because the French drink wine habitually and thus see it as more of a necessity than the Americans.
   - Another example could be how fresh seafood is seen as a staple and necessity with 0<YED<1 in coastal communities but seen as a luxury good with YED>1 for land-locked communities.

Self-Assessment 2: Fill-in-the-Blanks

1. Good A has a YED value of -0.65. This means that it is a/n _____ (inferior/necessity/luxury) good.

2. Good B has a YED value of 2.13. This means that it is a/n _____ (inferior/necessity/luxury) good.

3. Good C has a YED value of 0.18. This means that it is a/n _____ (inferior/necessity/luxury) good.

2.6.2 Cross Elasticity of Demand (Price of Related Goods – Substitutes and Complements) & Derived Demand

To understand how change in price of related goods, e.g. substitute and complementary goods, would affect the demand for a good, we need to apply the concept of **Cross Elasticity of Demand (XED).**

2.6.2.1 Definition and Formula of XED

Definition: The cross elasticity of demand (XED) measures the degree of responsiveness of demand for Good Y to a change in the price of Good X, ceteris paribus.

*Note: The change in price of the related good X is the **'cause'**, while the change in demand for Good Y is its 'effect'. There will therefore be a shift in the demand curve for Good Y, since "change in price of a related good" is a non-price factor.*

Students should use 'demand' in the definition of XED – and not 'quantity demanded' because XED measures the responsiveness of demand – not quantity demanded – to a change in the non-price factor of 'change in prices of related goods'.

FORMULA:

$$\text{XED} = \frac{\text{Percentage change in quantity demanded of good Y}}{\text{Percentage change in price of good X}}$$

$$= \frac{\dfrac{\Delta Q_y}{Q_y} \times 100\%}{\dfrac{\Delta P_x}{P_x} \times 100\%} = \frac{\Delta Q_y}{\Delta P_x} \times \frac{P_x}{Q_y}$$

Where Q_y = initial quantity demanded of good Y,
ΔQ_y = change in quantity demanded of good Y,
P_x = initial price of good X,
ΔP_x = change in price of good X

Note: With a change in price of related Good X, demand for Good Y changes and its entire demand curve shifts. When calculating XED, we need to use two points on the two demand curves in the formula. Therefore, the formula requires the use of quantity demanded, i.e. it is not possible to use the whole demand curve in the calculation.

However, students should be clear that, conceptually, XED is about the responsiveness of demand to a given change in price of related goods, which is a non-price factor. This contrasts with PED (to be covered in Section 8) that analyses the responsiveness of quantity demanded to a given change in price.

Cross elasticity of demand measures the extent of horizontal **shift** in the demand curve of Good X in response to changes in the price of Good Y.

Note: Students should be careful about when to use 'Qd' and when to use 'Demand' when explaining the relationship between price of Good X and demand for Good Y using XED:
Δ P of Good X ('cause') → Δ Qd of Good X → Δ Demand for Good Y ('effect')

2.6.2.2 Degrees of Cross Elasticity of Demand

The cross elasticity of demand for Good X with respect to price of Good Y can vary from negative infinity to positive infinity.

Sign of XED

The sign of XED tells us the **relationship** between the two goods: whether they are substitutes, complements or unrelated goods. A positive sign indicates that the related good is a substitute and a negative sign indicates that the related good is a complement:

| a) Positive Cross Elasticity of Demand (XED > 0) [Substitutes]	b) Negative Cross Elasticity of Demand (XED<0) [Complements]	c) Zero Cross Elasticity of Demand (XED=0) [Unrelated goods]
If two goods are **substitutes**, XED would always be **positive**. This means that an *increase* in price of Good X would bring about an *increase in demand for its substitute Good Y.* i.e. price of Good X and demand for Good Y are *directly* related.	If two goods are **complementary**, XED would always be **negative**. This means that an increase in the price of Good X would bring about a *decrease in the demand for its complement*, Good Y. i.e. price of Good X and demand for Good Y are *inversely* related.	When two goods are **independent** of each other in terms of one's demand in relation to the price of the other good (i.e. they are not related), their XED will be zero.
For example, supposing beef and mutton are substitutes, when the price of beef *rises*, the quantity demanded of beef would fall, leading to an *increase* in the demand for mutton. Hence a *rise* in the price of beef would lead to a *rise* in demand for mutton, i.e. the XED of mutton with respect to the change in price of beef is **positive**. Other examples: Coke and Pepsi, HL milk and Meiji milk, taxi rides and bus rides.	For example, given that cars and petrol are complementary goods, if there is an increase in the price of cars, it would lead to a decrease in the quantity demanded of cars. Since petrol is needed in car usage, a decrease in quantity of cars demanded would lead to a decrease in the demand for petrol. Hence, a *rise* in the price of cars would lead to a *fall* in the demand for petrol. Therefore, the XED of petrol with respect to the price of cars is **negative**.	Most pairs of goods selected at random would be **unrelated**: e.g. tea and sneakers or beer and socks.

Magnitude of XED

The magnitude of XED of Good X with respect to price of Good Y indicates the **closeness** of substitutability and complementary relationship between the two goods.

a) Cross Elastic Demand (|XED| >1)	b) Cross Inelastic Demand (|XED| <1)
If the absolute value of the coefficient is ***greater than one***, this implies that the relationship between the two goods (whether complements/ substitutes) is ***strong***. Therefore, a change in the price of Good X will lead to a more than proportionate change in the demand for Good Y. When two goods are perfect substitutes for each other, their XED is positive infinity. When two goods are perfect complements for each other, their XED tends towards negative infinity.	If the absolute value of the coefficient is ***less than one***, this implies that the relationship between the two goods (whether complements/ substitutes) is ***weak***. Therefore, a change in the price of Good X will lead to a less than proportionate change in the demand for the Good Y.

*Note: Similar to YED, when analysing XED, students should first analyse the sign (i.e. positive/ negative) **before** analysing the magnitude (i.e. the value):*

- *The **sign** indicates the direct/inverse relationship between price of Good X and demand for Good Y, i.e. whether a change in price will change demand for Good Y in the same/ different direction. This also tells us whether the two goods are substitutes or complements. (Zero value indicates unrelated goods).*
- *The **magnitude** indicates the closeness of two goods, i.e. whether the demand for Good Y changes more/less than proportionately in response to a given change in price of Good X.*
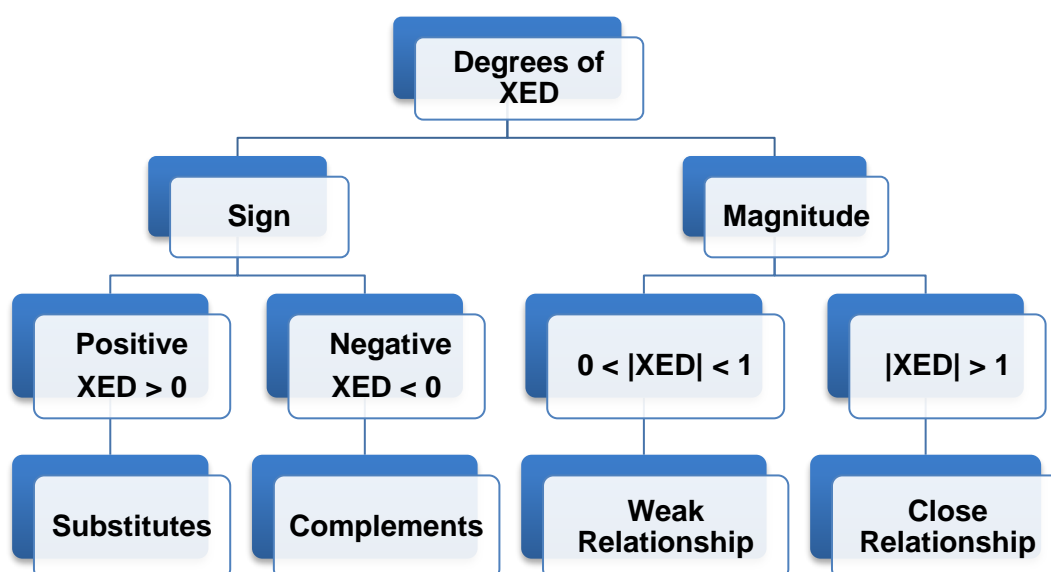
Self-Assessment 3: Fill-in-the-Blanks

1. Good X has a XED value of +0.57 with Good Y. They can be considered _____ (strong/weak) _____ (substitutes/complements) for each other.

2. Good Y has a XED value of -2.97 with Good Z. They can be considered _____ (strong/weak) _____ (substitutes/complements) for each other.

3. Good Z has a XED value of 0 with Good A. What does this imply about their relationship? _____

The above categories can be summarised diagrammatically below in terms of the direction and magnitude of shift of demand for Good Y (Figure 6) when there is an **increase in the price of Good X.**

(Fig. 6a)

Consider an increase in price of Good X, e.g. Coca Cola.

Assuming a given supply curve for Good Y:

» If Good Y were a close substitute, e.g. Pepsi, an increase in the price of Good X (Coca Cola) will cause the demand for Good Y (Pepsi) to increase more than proportionately, and its demand curve will shift from D_0 to D_2 by a greater extent since Coca Cola & Pepsi are close substitutes.

» On the other hand, if Good Y were a weak substitute, e.g. Milk, then the demand for Good Y will increase less than proportionately to D_1.
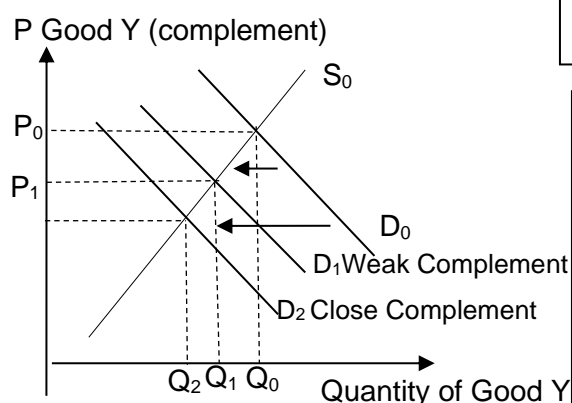

(Fig. 6b)

[Note: The diagrams above depict the market for Good Y, i.e. demand change of Good Y – not the market for Good X, i.e. price change of Good X.]

Figure 6: How the demand of Good Y changes (direction & magnitude) in response to a change in price of its substitute/ complementary good (Good X)

Consider an increase in price of Good X, e.g. Bread.

Assuming a given supply curve for Good Y:

» If Good Y were a close complement, e.g. Butter, an increase in the price of Good X (Bread) will cause the demand for Good Y (Butter) to decrease more than proportionately from D_0 to D_2 since Bread and Butter are **close** complements.

» On the other hand, if Good Y were a **weak** complement, e.g. canned tuna, the demand for Good Y will decrease less than proportionately from D_0 to D_1.

Food for Thought:

Cross Elasticity of Demand to Food
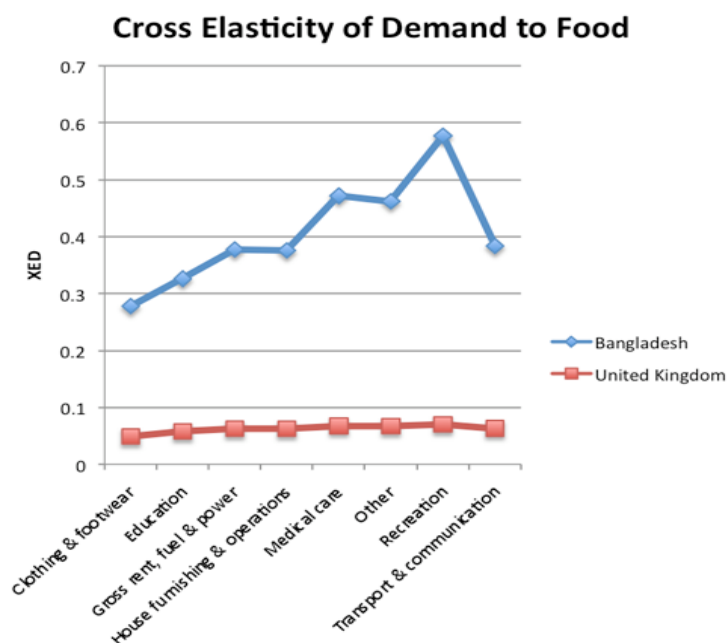
The figure above shows the XED of various goods to the price of food in Bangladesh and the United Kingdom. From the figure, we can clearly see the relationship between food and various other necessities, i.e. they are substitutes.

However, why is there a difference in the XED of the same good to the price of food between the two countries?

2.6.2.3 Determinant of XED

Perceptions of consumers [Closeness of Relationship]

Like the concept of income elasticity of demand (YED), the key factor that determines the XED of a good is consumers' perception of the relationship between Goods X and Y – whether the two goods are substitutes or complements and whether the relationship between them is strong or weak.

While it is likely that few consumers will dispute whether two goods are complements or substitutes, they may have different perceptions of the strength of the relationship. For example, because of popularity of bubble tea in Singapore, tapioca pearls can be seen as a much closer complement to tea here than in the UK, where tea is often drunk on its own.

Derived Demand

Aside from complements and substitutes, goods can also be related to each other if one is a **factor input** of the other. In such cases, an increase in demand for the final good can lead to an increase in demand for the factor input. Conversely, a fall in demand for a final good or service will result in a fall in demand for the factor input, since the latter is a factor of production of the former. This relationship is termed as *derived demand*, since the demand for the factor input is derived from the demand for the final good.

> **Definition:**
> **Derived demand** is the demand for a factor of production that results from the demand of a final good.

For example, rising demand for furniture can result in a rise in demand for raw materials e.g. wood, labour and other factors of production. Likewise, the increased demand for mobile phones can result in a rise in demand for OLED screens and all its relevant component parts.

> *Note:*
> *Do not confuse goods that are **complementary** with goods that are in a **derived demand relationship**.*
>
> | | |
> |---|---|
> | *Goods that are **complementary** (i.e. have negative XED) are <u>both finished goods</u>, e.g. petrol & car or socks & shoes.* | *When we refer to **derived demand**, one good is a <u>factor input</u> and the other good is a <u>finished good</u>.*
 E.g. furniture (finished good) & raw timber (factor input) or cappuccino (finished good) & barista (factor input). |

2.6.3 Consumers' Tastes and Preferences

Consumers' tastes and preferences can change over time because tastes and preferences are affected by peers, advertisements, pop-star appeal, changes in the prevailing fashions and trends, and even weather conditions etc.

Changes in consumers' tastes in favour of (or away from) a good or service will raise (or reduce) its demand.

For example, when a celebrity endorses a particular watch brand, consumers' tastes will change in favour it, and demand for watches produced by that brand will increase (vice versa if the celebrity is involved in a scandal!) Also, the demand for umbrellas and raincoat will increase during the monsoon season as consumers seek (and thus prefer) protection from the rain.

2.6.4 Consumers' Expectations

Consumers' expectations of the future will affect their decision to purchase now.
- If consumers **expect the price of a good to rise in <u>future</u>**, they will buy more now, **raising the <u>current</u> demand** for the good concerned. Demand curve shifts to the right.

- If consumers **expect the price of a good to fall in <u>future</u>**, they will postpone their purchases now, **reducing the <u>current</u> demand** for the good concerned. Demand curve shifts to the left.

An example will be the expectation of prices of Certificate of Entitlement (COE) for car ownership in Singapore. If consumers expect COE prices to rise, they will buy more cars now. However, if they expect COE prices to fall, they will postpone their purchases.

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*Note: The above is referring to expectations of **future prices** affecting current demand. It is different from changes in **current prices** mentioned in 2.5.1 which affect the quantity demanded.*

If consumers **expect their income to increase in future**, they are likely to **increase their current demand** as well, as they are less concerned about saving for the future. Hence, consumers' current demand is affected by their expectations of future prices and/or future income.

2.6.5 Ease of Borrowing

Sometimes, consumers may borrow money to pay for goods and services and consume beyond their income. The availability of loans therefore affects the demand for goods and services.

When banks are more willing to lend (e.g. by granting more loans applications), consumers are more able to consume since they can borrow more money to pay for goods and services. Demand for goods and services – especially big-ticket items – increases.

2.6.6 Size and Composition of Population

Demand can change when population size and composition changes.

- An **increase in the size of a country's population** will lead to an increase in the number of consumers in the market, therefore increasing the demand for goods and services.

- Demand can also change because of a **change in the composition or structure of the population**, such as when developed countries start experiencing aging populations. An increase in the proportion of elderly in the population will increase the demand for commodities and amenities commonly used by this age group e.g. wheelchairs, walking sticks, healthcare services, etc.

2.6.7 Seasonal Factors

The demand for many goods and services such as clothing, food, healthcare and travel is influenced by **seasonal and/or climatic conditions.**

E.g. During the winter season, the demand for winter clothing increases, shifting the demand curve for winter clothing to the right. After school holidays, the demand for air travel decreases, shifting the demand curve for air travel to the left.

2.6.8 Government Policies

Government policies also affect the demand for goods and services. There are many ways in which this can happen:

A government policy, such as anti-smoking campaigns, may influence consumer **tastes and preferences**. If the campaigns are effective, consumers' tastes and preferences will switch away from cigarettes, resulting in a decrease in demand for cigarettes.

Government policies, such as an increase in *income tax* rates (also known as ***direct taxes***), will reduce consumers' **disposable income**, causing a decrease in demand for **normal goods** and an increase in demand for **inferior goods**.

Government regulations such as laws that ban (e.g. e-cigarettes) or restrict usage (e.g. e-scooters) of goods would also reduce demand for such goods.

Self-Assessment 4:

1. List down at least 3 factors that might increase the demand for:

   (i) Laptop computer; and (ii) Overseas vacation.

2. Suppose that one of the following events occurs, state if these events would result in a movement along the demand curve for air travel <u>or</u> a shift in the demand curve for air travel.
   a. World economy suffers from a recession leading to a loss of income.
   b. The price of petrol soars and airlines push the higher operating cost to consumers as higher airline ticket price.
   c. Terrorist threat to air travel heightens.

Summary Table for Non-Price Determinants of Demand (E.G.Y.P.T.S.)	
E	Expectations of Prices & Income, Ease of Borrowing
G	Government Policies
Y	Income (Inferior and Normal Goods based on YED)
P	Price of Related Goods (Substitute and Complementary Goods based on XED & Derived Demand) + Population Size/Composition
T	Taste and Preferences
S	Seasonal Factors (Weather and Festivities)

3   Theory of Supply

3.1   Definition of Supply

Definition:
Supply is defined as the **amount** of a good or service that producers are both **willing and able** to sell at **each possible price** in a given period of time, ceteris paribus.

As with demand, it is important to distinguish between *'quantity supplied'* and *'supply'*.

Definitions	
Quantity supplied refers to a particular quantity offered for sale at a particular price, as reflected by a <u>point</u> on a given supply curve.	**Supply** refers to quantity supplied at <u>every price</u>, i.e. the relationship between price and quantity supplied, as represented by the entire supply schedule or supply <u>curve</u>.

3.2   The Law of Supply

Definition:
The law of supply states that in a given time period, the quantity supplied of a product is <u>directly related</u> to its price, ceteris paribus.

Note: The law of supply refers to the direct relationship between price and '*quantity supplied*' – not '*supply*'. The difference between '*quantity supplied*' and '*supply*' will be made clearer in Section 3.5.

The higher the price of a good or service, ceteris paribus, the greater the willingness and ability of producers to sell, hence the greater the quantity supplied, and vice versa.

3.2.1   Reasons for the Law of Supply

This direct relationship between price and quantity supplied can be explained through the following:

i. Profit is the reward to the entrepreneur for risk-taking and innovation. The basic assumption of the behaviour of producers is that they are motivated by profit**.** Therefore, profits provide producers with the **willingness** to supply goods.

> *Note: Profit = Total Revenue – Total Cost*

The willingness of producers to supply a good is determined by the revenue received in return for the good.

As the price of a good increases, ceteris paribus, a producer is willing to increase the quantity supplied since it is now more profitable (assuming costs remain the same).

For example, an increase in the price of apples provides profit-motivated farmers with the potential to earn higher levels of profits than before. Hence, producers are willing to plant more apple trees and increase quantity supplied of apples.

ii. Higher prices also increase the **ability** to supply a good or service (For H2 Economics students)

Producers incur costs during production of goods and services, such as cost of raw materials and labour costs. When a producer increases output, each additional unit of good or service is increasingly costly as factors of production become increasingly scarce. Hence, marginal cost (MC) of production increases as more of a good is produced.

Producers will produce an additional unit of good and offer it for sale only if the marginal revenue (price paid for the unit of good) is able to cover the marginal cost (MC) of production. By the Marginalist Principle, profit-maximising producers will produce until marginal revenue = marginal cost (MR = MC). Therefore, for individual supply:

Price (Marginal Revenue) = Marginal Cost

Since producers face an increasing marginal cost for additional units of output, they must receive a higher price for the additional units of output before they are able to increase the quantity supplied. This explains the **direct relationship between price and quantity supplied**, and the **upward-sloping supply curve**.

3.3   Individual Supply Schedule and Curve

Definition:
An individual supply refers to the supply of one producer.

The individual's supply can be represented in the form of a table known as a supply schedule.

Price ($) per packet	Quantity (Packets of Coffee)
1	0
2	2
3	4
4	6
5	7
6	8

Table 3: Firm A's Supply Schedule

The supply schedule represents the relationship between price and quantity supplied in a table. It shows the various amounts of a product that a producer is willing and able to sell at each specific price over a range of prices during a given time period. When the individual supply schedule is plotted, it gives us an individual <u>supply curve</u>.

Figure 7: Firm A's Supply Curve
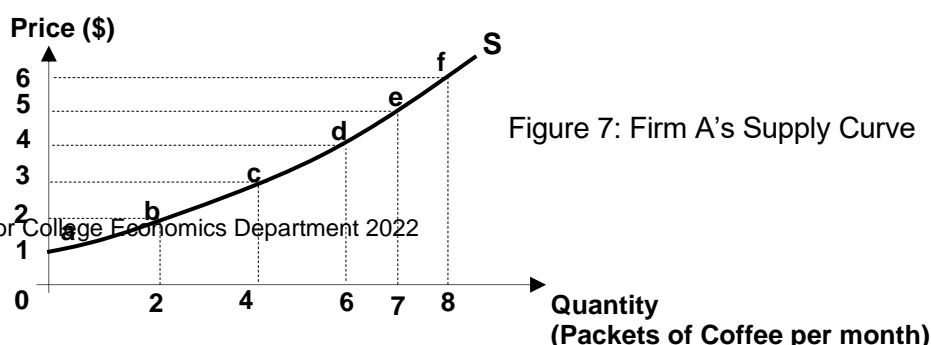
Each combination of price and quantity supplied listed in the supply schedule in Table 3 is a point in Figure 7. Point f indicates that if the price of a packet of coffee is $6.00, Firm A is willing and able to supply 8 packets of coffee per month. The supply curve slopes upward indicating a positive relationship between the price and quantity supplied (the Law of Supply).

3.4   Market Supply Schedule and Curve

> **Definition:**
> Market supply is the sum of the individual supplies of all the producers in the market.

It is derived by summing up the quantity supplied of each producer in the market at every price level (horizontal summation).

For example, let us assume that the market for coffee has only two sellers – Firm A and Firm B. To obtain the market supply for coffee, we add the amounts of each seller at each price. For example, at a price of $1, Firm B is willing and able to supply 1 packet of coffee while Firm A none. The quantity supplied by the market at the price of $1 is therefore 1 packet.

Fill in the quantity supplied for coffee by the market at all prices in Table 4 below.

Price ($) per packet	Quantity (Packets of Coffee)		
	Firm A	Firm B	Market Supply
1	0	1	1
2	2	2	
3	4	5	
4	6	8	
5	7	13	
6	8	16	

Table 4: Deriving the Market Supply Schedule

The **horizontal summation of the individual supply curves** gives the market supply curve as shown in Figure 8 below.

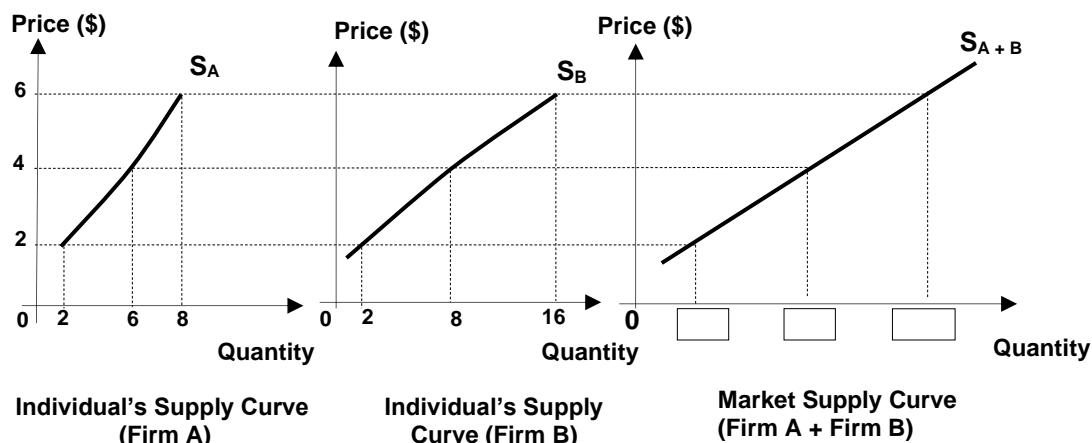Fill in the empty boxes to indicate the correct market quantity supplied at the corresponding price.

Figure 8: Derivation of Market Supply Curve

At the price of $6, the quantity supplied by the market – 24 packets of coffee per month – is the sum of the quantity supplied by Firm A (8) and the quantity supplied by Firm B (16).

The quantity supplied by the market at all other prices is obtained in a similar way to derive the market supply curve, S_{A+B}.

In general, the word "supply" refers to <u>market supply</u> of a good or service unless stated otherwise.

3.5   Change in Quantity Supplied vs Change in Supply

IMPORTANT

A **change in <u>Supply</u>** is due to **changes in <u>non-price</u> determinants** and is **represented by a <u>shift</u> of the supply curve**	A **change in <u>Quantity Supplied</u>** is caused by **changes in <u>price</u>** and is **represented by a movement** along the supply curve.

3.5.1   Change in Quantity Supplied (Price Determinant)

When a change in the quantity of a good or service sold by producers is due to a **change in price** of the good or service, economists say that there was a **change in quantity supplied** of the good or service.

Diagrammatically, such a change is illustrated by a **movement along the supply curve** of the good or service as shown in Figure 9.

An increase in quantity supplied of coffee from 14 to 24 units of coffee (caused by a rise in the price from $4 to $6) is represented by **a movement up** the supply curve from Point A to C.

A decrease in quantity supplied of coffee from 14 to 4 units of coffee (caused by a fall in the price from $4 to $2) is represented by **a movement down** the supply curve from Point A to B.
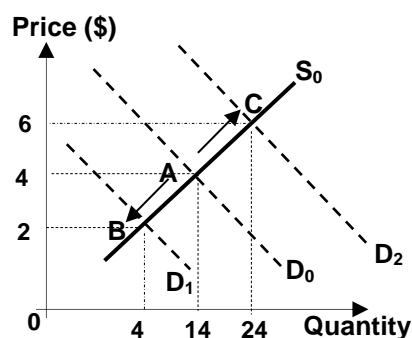

Figure 9: Changes in *Quantity Supplied* of coffee

Note: In Figure 9, changes in price are assumed to be caused by changes in demand.

3.5.2 Change in Supply (Non-Price Determinant)

Change in supply occurs only when there are changes to factors <u>NOT</u> relating to the price of the good or service itself. Changes in supply are caused by changes in **NON-PRICE DETERMINANTS.**

Diagrammatically, such a change is illustrated by a **shift in the supply curve** of the good or service as shown in Figure 10 to the right.

An increase in supply is represented by the **rightward shift** of the supply curve. **At each and every price, there is now an increase in quantity supplied for coffee.**
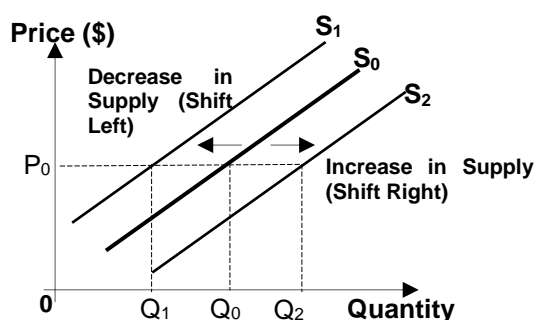

Figure 10: Changes in *Supply* of Coffee

E.g. when supply increases (shifts right from S_0 to S_2), the quantity supplied at every price increases. To illustrate, at the same price of P_0, quantity supplied increases from Q_0 to Q_2. The same is true for all other prices.

A **decrease in supply** is represented by the **leftward shift** of the supply curve. At each and every price, there is now a decrease in quantity supplied for coffee.

E.g. when supply decreases (shifts left from S_0 to S1), quantity supplied at P_0 decreases from Q_0 to Q_1.

3.6 Non-Price Determinants of Supply

Changes in factors <u>not</u> related to the price of the particular good or service will *shift* the supply curve, either to the left or to the right.

3.6.1 Price & availability of Factor Inputs/ Factors of Production

The price at which producers are willing and able to sell output depends on the cost of production. The cost of production includes labour costs, rent payment and costs of raw materials etc. These costs are in turn affected by the price and availability of the respective factor inputs For example, bad weather affected the yield of rice and thus with reduced supply (i.e. availability) of rice leading to higher price for rice, this increases the cost of production of many Asian dishes (sushi, chicken rice etc.).

The effect of an increase in the cost of production decreases supply and shifts the supply curve to the left (S_0 to S_1 in Figure 10). When the price of factor inputs increases, the cost of producing the same quantity of the good increases. This reduces the profits and the incentive to produce by producers. Therefore, at each and every price, there is now a decrease in the quantity supplied of the good.

E.g. a rise in the price of crude oil will raise the cost of production for transport services, such as train rides and air travel. Therefore, the supply of train rides and air travel will fall.

3.6.2 State of Technology

Technological changes take place over time as a result of discoveries, innovation and enterprise. An improvement in technology can give rise to **more efficient production.** This enables the producers to use fewer factors of production and requires lesser production time for the production of a given output, therefore lowering the unit cost of production, which in turn increases profits (i.e. total revenue minus total cost) and the incentive of producers to produce at every price. Therefore, supply increases, shifting the supply curve to the right.

E.g. the mechanisation of the agriculture industry has led to a rise in productivity within the industry, resulting in an increase in the supply of agricultural products.

3.6.3 Price of Related Goods – Competitive and Joint Supply

The quantity of any good or service that producers sell depends in part on the price of related goods or services. Two goods or services may be related when they are in competitive or joint supply.

3.6.3.1 Competitive Supply

> **Definition:**
> Goods in competitive supply are those that use **similar resources** for production.

For example, carrots and potatoes both require land and agriculture labour for production. If the **price of carrots rises** due to an increase in demand from D_0 to D_1 (Fig. 11a), farmers may decide to produce more carrots (**quantity supplied of carrots rises** from Q_0 to Q_1), ceteris paribus.

This increased production of carrots will divert resources away from producing potatoes. Hence, the **supply of potatoes falls**, as shown by the leftward shift of supply curve from S_0 to S_1 in Fig 11b, ceteris paribus.

The supply of a good is inversely related to the price of goods with which it is in competitive supply.
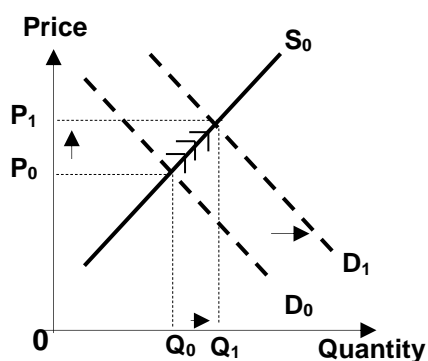

Figure 11a: Market for Carrots
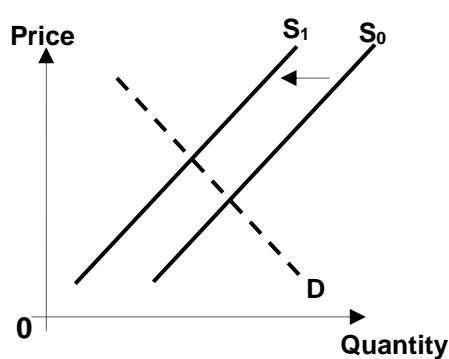(Quantity Supplied of carrots rises)

Figure 11b: Market for Potatoes
(Supply of Potatoes Falls)

3.6.3.2 Joint Supply

> **Definition:**
> Goods in joint supply are goods that are also produced when the other is produced.

For example, when cows are slaughtered for beef, leather will also be made available. If the **price of beef rises** due to an increase in demand from D_0 to D_1, farmers may decide to produce more beef by slaughtering more cows (i.e. **quantity supplied of beef rises** from Q_0 to Q_1), ceteris paribus (Fig. 12a).

This increased production of beef means more leather will also be produced in the process. Hence, the **supply of hides rises**, as shown by the rightward shift of supply curve from S_0 to S_1 in Fig. 12b, ceteris paribus.
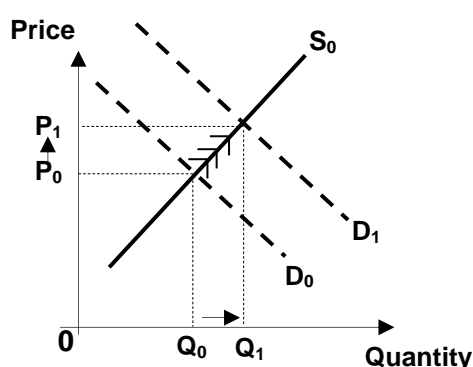
Figure 12a: Market for Beef
(Quantity Supplied of beef rises)
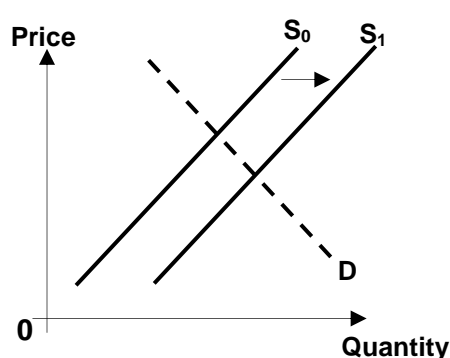
Figure 12b: Market for Hides
(Supply of Hides Rises)

3.6.4 Seasonal factors and weather

The output of some agricultural products is severely affected by variation in weather conditions.

Favourable weather conditions could bring about a productive harvest and increased supply of fresh vegetables while poor weather conditions (e.g. droughts) would bring about decreased supply of fresh vegetables.

The supply of certain agricultural products is dictated by seasons. For example, durians can only be harvested during a particular time in a year and hence the supply of these products will rise during this period.

3.6.5 Government policies

Government policy affects supply through the imposition of taxes or granting of subsidies.

The imposition of **taxes** on goods and services (also known as *indirect taxes*), e.g. goods and services tax (GST), will increase the costs of production faced by the producers, causing profits to drop and thus reduces the incentive for producers to produce. As a result, supply decreases. For example, as announced in Budget 2018, the rate of the GST would increase from 7% to 9% at some time during the period from 2021 to 2025. As a result, supply of goods and services fall when the GST is increased.

Subsidies have the opposite effect. Subsidies lower costs of production, and increase their profits and incentive to produce by producers. These will increase supply and shift the supply curve to the right.

> *Note: **Indirect taxes** (e.g. GST / carbon tax) on goods & services are **levied on producers** and thus would affect supply but **direct taxes** on incomes (e.g. personal income tax) affects consumers and thus would affect demand (see section 2.6.8).*

3.6.6 Producers' Expectations

The supply of a good will also be affected by the expectations of producers on future prices.
- If **producers expect price to increase in future**, they **will reduce supply now** and raise their level of stocks at hand and release them only when prices increase.
- If **producers expect price to fall in future**, they **will raise supply now** to draw down their stocks to sell and avoid holding on to stocks when the price does fall.

	Summary Table for Non-Price Determinants of Supply (W.E.T.P.I.G)
W	Weather or Seasonal Factors
E	Expectations of producers
T	Technology
P	Price of Related Goods (Joint/ Competitive Supply)
I	Input prices
G	Government Policies

4   Price Determination

> **Definition:**
> A market can be defined as an arrangement whereby buyers and sellers can negotiate to exchange (buy and sell) goods, services, or factors of production at an agreed price.

From the previous sections, you will realise that consumers and producers react differently to price changes based on the Law of Demand and Law of Supply:
- As price <u>rises</u>, consumers decrease their quantity demanded (Q_d) but producers increase their quantity supplied (Q_s).
- As price <u>falls</u>, consumers increase their quantity demanded (Q_d) but producers decrease their quantity supplied (Q_s).

Consumers and producers will continue to change their quantity demanded and quantity supplied respectively until both are equal ($Q_d = Q_s$).

4.1   Market Equilibrium

Where **<u>quantity demanded equals quantity supplied</u>**, the market is in a state of equilibrium. Equilibrium is a state of rest where <u>there is no tendency for any change</u>. This is commonly known as "market equilibrium".

> *Note: Market equilibrium occurs when **'quantity demanded equals quantity supplied'** – **not** when 'demand equals supply'.*

4.2   Equilibrium Price and Quantity/Output

The equilibrium price (or the market clearing price) and equilibrium quantity/ output refer to the price and quantity/ output respectively at which **quantity demanded equals quantity supplied** (at point E in Fig. 13)**.**

Once equilibrium price and quantity is reached, e.g. P_e and Q_e in Figure 13, there is **no more tendency to change** unless there are changes in demand or supply conditions.

- Point E represents the market equilibrium.
- At point E, Q_d equals Q_s.
- Q_e and P_e are known as equilibrium quantity and equilibrium price respectively.
- Market clears at point E where there is no pressure on Price and Quantity to change
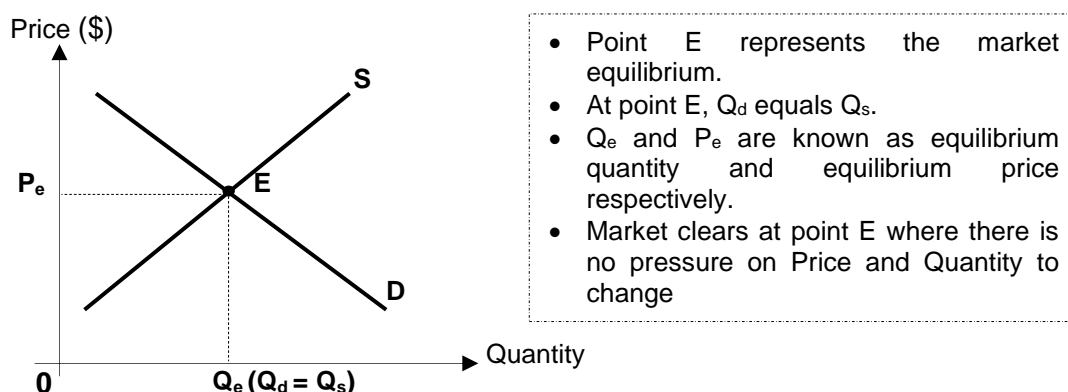
Figure 13: Market Equilibrium

4.3   Interaction between Demand and Supply Forces

Let us return to the example of the market demand and market supply of coffee, and use the data from Tables 2 and 4. These figures are given again in Table 5.

At a price of $1 per packet of coffee, quantity demanded by consumers in the market is 28 packets of coffee while quantity supplied by producers is 1 packet, hence, there is a shortage of 27 packets. Shortages exert upward pressure on price, causing price to rise.

On the other hand, at a price of $6 per packet of coffee, quantity demanded is 3 packets of coffee while quantity supplied is 24 packets, hence, there is surplus of 21 packets. Surpluses exert downward pressure on price, causing price to fall.

Identify the patterns and fill in Table 5 below to find the market equilibrium price and quantity where there is no pressure for price to change further.

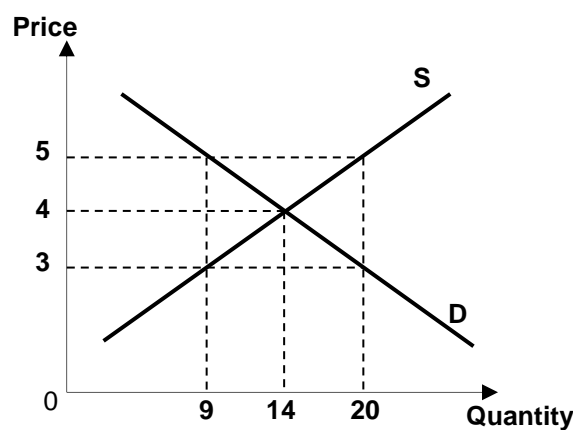| Price ($) per packet	Quantity (Packets of Coffee a per month				
	Q_d	Q_s	Difference	Shortage/ Surplus	Pressure on Price
1	28	1	- 27	Shortage	Upward
2	24	4			
3	20	9			
4	14	14			
5	9	20			
6	3	24	+21	Surplus	Downward

Table 5: Demand and Supply Schedules of Coffee

Figure 14: Market for Coffee

Graphically, Figure 14 illustrates the market equilibrium in the market for coffee, which occurs at the price of $4.00 for which 14 packets of coffee are exchanged in the market.

When quantity supplied exceeds quantity demanded (i.e. surplus)

The Explanation of the Price Adjustment Process- 4 'I' Approach

Step 1: Identify Qd and Qs at stated price	At the price of $5, the quantity supplied by producers is **20** packets of coffee but the quantity demanded by consumers is only **9** packets.
Step 2: Identify Shortage or Surplus	The quantity supplied exceeds quantity demanded by **11** packets. There is a **surplus** of **11** packets at the <u>original price</u> of $5. This surplus represents a disequilibrium in the market.
Step 3: Identify Price, Qd and Qs changes based on Laws of Demand & Supply	Producers are willing to reduce their price to eliminate the surplus and this exerts a downward pressure on the price. In response to the fall in price, other producers would reduce the quantity supplied and consumers would increase the quantity demanded.
Step 4: Identify Equilibrium	This would continue until Qd=Qs and the surplus is eliminated, market equilibrium price ($4) and quantity (14 packets) are

	established. At market equilibrium, there is no pressure for prices to fall further.

When quantity demanded exceeds quantity supplied (i.e. shortage)

Explanation of the Price Adjustment Process- 4 'I' Approach

Step 1: Identify Qd and Qs at stated price	At the price of $3, quantity supplied by producers is only **9** packets of coffee but the quantity demanded by consumers is **20** packets.
Step 2: Identify Shortage or Surplus	The quantity demanded exceeds quantity supplied by **11** packets. There is a **shortage** of **11** packets at <u>the original price</u> of $3. This shortage represents a disequilibrium in the market.
Step 3: Identify Price, Qd and Qs changes based on Laws of Demand & Supply	Consumers who could not get all they want at the price of $3 would be willing to pay more to compete with other consumers, and this exerts an upward pressure on the price. In response to the increase in price, other producers would increase the quantity supplied and consumers would decrease the quantity demanded.
Step 4: Identify Equilibrium	This would continue until Qd=Qs and the shortage is eliminated, market equilibrium price ($4) and quantity (14 packets) are established. At market equilibrium, there is no pressure for prices to rise further.

4.4   Changes in Demand and Supply on Equilibrium Price and Quantity

> *Note: Surplus & Shortage refer to quantities (horizontal **distance** between Qd & Qs) at the original price, <u>not</u> the **area**.*

The equilibrium price and quantity will remain unchanged so long as the demand and supply conditions remain unchanged. We learnt that the non-price determinants of demand and supply will result in changes to demand and supply respectively. Any changes in demand and/or supply will lead to a new equilibrium being formed.

4.4.1   Changes in Demand Only, Ceteris Paribus

An increase in demand will lead to an **increase in equilibrium price and quantity**, ceteris paribus.

Figure 15: Increase in Demand

The Explanation of the Price Adjustment Process- 4 I Approach

Step 1: Identify Qd and Qs at Original Equilibrium Price	After an increase in demand from D_0 to D_1 in Fig 15, the Quantity Demanded is at Q_2 and Quantity Supplied is at Q_0 at the original equilibrium price Po
Step 2: Identify Shortage or Surplus at Original Equilibrium Price	This creates a shortage of Q_0Q_2 at the initial price P_0.
Step 3: Identify Price, Qd and Qs changes	Consumers compete among themselves and bid up the price. In response to the rise in price, producers increase their quantity supplied and other consumers reduced their quantity demanded according to the Laws of Supply and Demand respectively.
Step 4: Identify New Equilibrium	The adjustment process continues until the new equilibrium P_1 and Q_1 is reached where Q_d equals to Q_s at Point E. Therefore, a rise in demand for a good, ceteris paribus, will cause a <u>rise in both equilibrium price and equilibrium quantity</u>.

Conversely, a decrease in demand will lead to a **decrease in equilibrium price and quantity**, ceteris paribus.
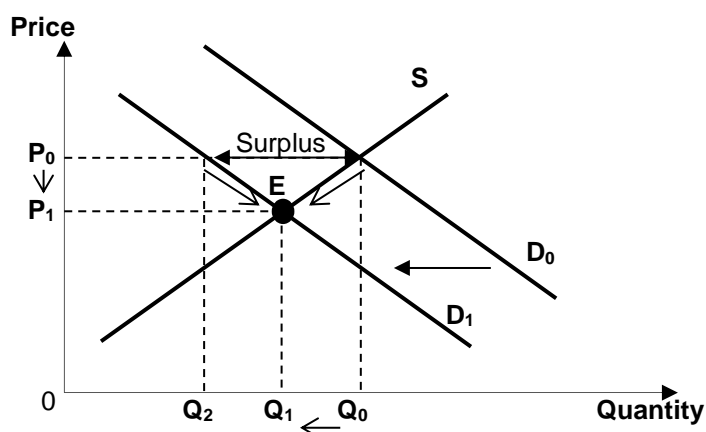
Figure 16: Decrease in Demand

The Explanation of the Price Adjustment Process- 4 I Approach

Step 1: Identify Qd and Qs at Original Equilibrium Price	After an decrease in demand from D_0 to D_1 in Fig 16, the Quantity Demanded is at Q_2 and Quantity Supplied is at Q_0 at the original equilibrium price Po
Step 2: Identify Shortage or Surplus at Original Equilibrium Price	This creates a surplus of Q_0Q_2 at the initial price P_0.

Step 3: Identify Price, Qd and Qs changes	Producers will reduce the price to clear excess stock. In response to the fall in price, consumers will increase their quantity demanded and other producers will reduce the quantity supplied according to the Laws of Demand and Supply respectively.
Step 4: Identify New Equilibrium	The adjustment process continues until the new equilibrium P_1 and Q_1 is reached where Q_d equals to Q_s at Point E. Therefore, a fall in demand for a good, ceteris paribus, will cause a <u>fall in both equilibrium price and equilibrium quantity</u>.

4.4.2 Changes in Supply Only, Ceteris Paribus

An increase in supply will lead to a **decrease in equilibrium price** and an **increase in equilibrium quantity**, ceteris paribus.


Figure 17: Increase in Supply

<u>The Explanation of the Price Adjustment Process- 4 I Approach</u>

Step 1: Identify Qd and Qs at Original Equilibrium Price	After an increase in supply from S_0 to S_1 in Fig 17, ceteris paribus, the Quantity Demanded is at Q_0 and Quantity Supplied is at Q_2 at the original equilibrium price Po
Step 2: Identify Shortage or Surplus at Original Equilibrium Price	This creates a surplus of Q_0Q_2 at <u>the initial price P_0</u>
Step 3: Identify Price, Qd and Qs changes	Producers will reduce the price to clear excess stock. In response to the fall in price, consumers will increase their quantity demanded and other producers will reduce the quantity supplied according to the Laws of Demand and Supply respectively.
Step 4: Identify New Equilibrium	The adjustment process continues until the new equilibrium P_1 and Q_1 is reached where Q_d equals to Q_s at Point E. Therefore, a rise in supply for a good, ceteris paribus, will <u>cause a fall in equilibrium price and a rise in equilibrium quantity</u>.

Conversely, a decrease in supply will lead to an **increase in equilibrium price** and a **decrease in equilibrium quantity,** ceteris paribus.
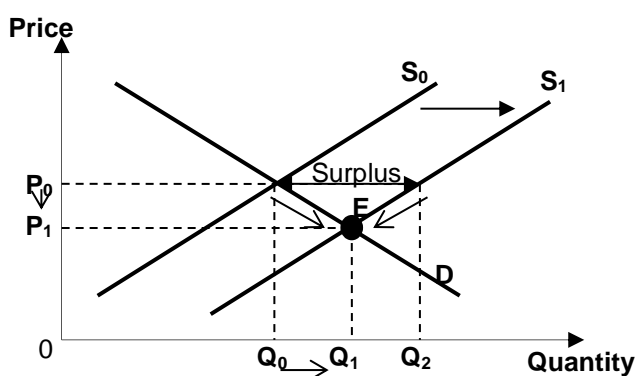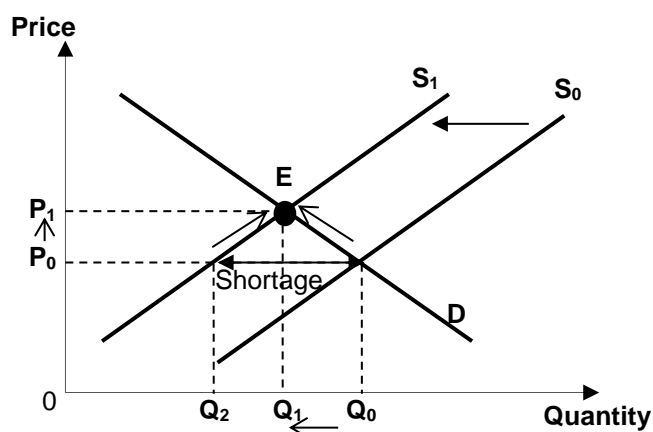

Figure 18: Decrease in Supply

The Explanation of the Price Adjustment Process- 4 I Approach

Step 1: Identify Qd and Qs at Original Equilibrium Price	After a decrease in supply from S_0 to S_1 in Fig 18, ceteris paribus, the Quantity Demanded is at Q_0 and Quantity Supplied is at Q_2 at the original equilibrium price P_0.
Step 2: Identify Shortage or Surplus at Original Equilibrium Price	This creates a shortage of Q_0Q_2 at <u>the initial price P_0</u>
Step 3: Identify Price, Qd and Qs changes	Consumers compete among themselves and bid up the price. In response to the rise in price, producers increase their quantity supplied and other consumers reduced their quantity demanded according to the Laws of Supply and Demand respectively.
Step 4: Identify New Equilibrium	The adjustment process continues until the new equilibrium P_1 and Q_1 is reached where Q_d equals Q_s at Point E. Therefore, a fall in supply for a good, ceteris paribus, will <u>cause a rise in equilibrium price and a fall in equilibrium quantity</u>.

Summary of Changes in Equilibrium Price and Quantity for Single Shifts (Please fill in the rest)

<u>Shifts in Curves</u>	<u>Shortage/Surplus</u>	<u>Equilibrium Price</u>	<u>Equilibrium Quantity</u>
Demand Increases	Shortage	Rises	Rises
Demand Decreases			
Supply Increases	Surplus	Falls	Rises
Supply Decreases			

4.4.3 Simultaneous Change in Demand and Supply

When only <u>one</u> of the curve shifts, we are certain how the equilibrium price and quantity will change.

However, when there is a <u>simultaneous</u> change in demand and supply, the change in equilibrium price and quantity will depend on the <u>extent of change</u> in demand and supply (magnitude of shift in the curves).

When both demand and supply increase, the equilibrium price may increase, decrease or remain constant, although equilibrium quantity will *always* increase.
- If demand increases by the same magnitude as the increase in supply, equilibrium price will remain constant (Fig 19(a)).
- If demand increases proportionately less than the increase in supply, equilibrium price will fall (Fig 19(b)).
- If demand increases proportionately more than the increase in supply, equilibrium price will increase (Fig 19(c)).

When both demand and supply rise, **equilibrium quantity rises** but **equilibrium price is indeterminate** and depends on the **extent of the changes** in demand and supply.
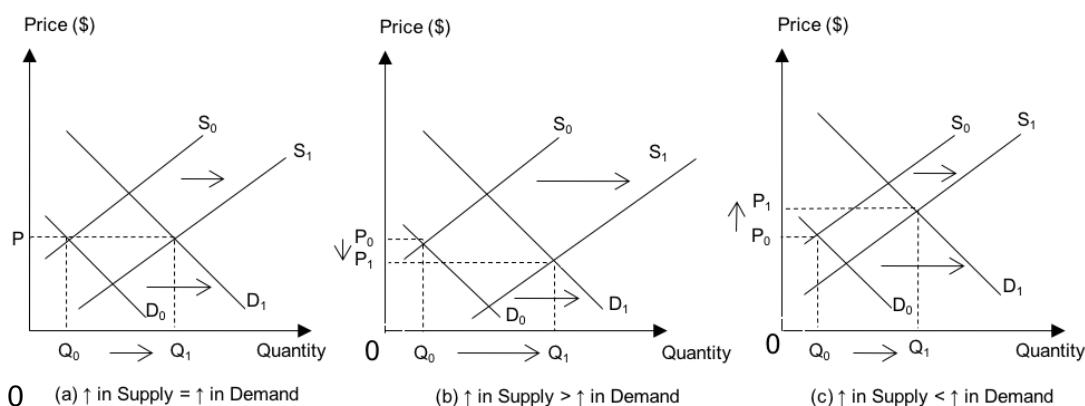
Fig 19: Changes in Price and Quantity with Simultaneous Change in Demand and Supply

Demand and supply can change in opposite directions as well.

It is important to be able to illustrate using a demand and supply diagram the different scenarios and explain the effects on equilibrium price and quantity.

Self-Assessment 5:

Using the templates below, draw the demand and supply diagrams illustrating the following and show the resultant change in equilibrium price and quantity:

i)   Demand increases proportionately more than the decrease in supply
ii) Demand increases proportionately less than the decrease in supply
iii) Demand increases proportionately to the decrease in supply

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i) Demand increases proportionately more than the decrease in supply
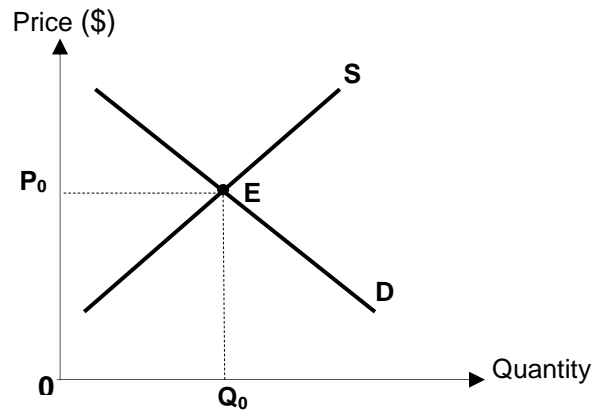
ii) Demand increases proportionately less than the decrease in supply
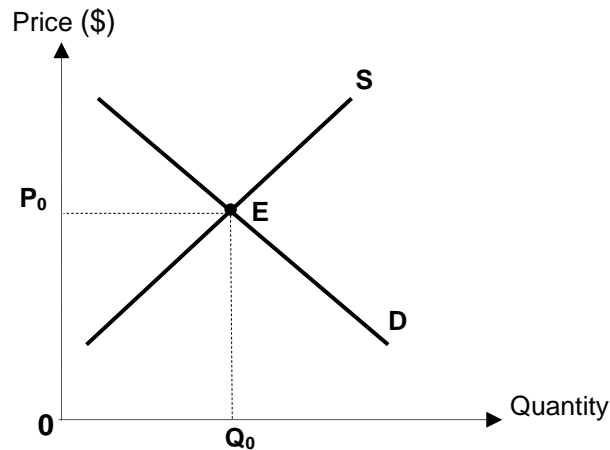
iii) Demand increases proportionately to the decrease in supply
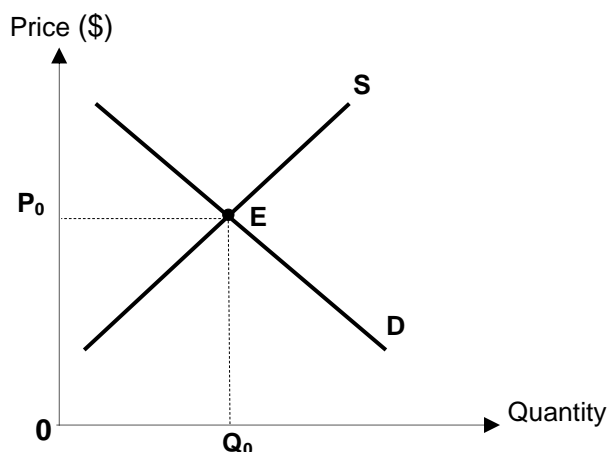
When demand increases and supply decreases, **equilibrium price rises** but the change in **equilibrium quantity is indeterminate** and depends on the **extent of the changes** in demand and supply.

If both demand and supply change in the same direction, equilibrium quantity will _____ while equilibrium price will be _____.

However, if demand and supply change in opposite directions, equilibrium quantity will _____ while equilibrium price will be _____

Self-Assessment 6:

There is no scarcity when market equilibrium is achieved. True/False? Explain.

---

5 Consumer and Producer Surplus

5.1 Consumer Surplus

Definition:
Consumer surplus is the **difference** between the maximum amount consumers are **willing and able to pay for a good or service and the amount actually paid for it.**

The consumer surplus represents a gain to consumers as they pay less for a good or service than they had been prepared to pay for it.

To understand the concept of consumer surplus, let us start with the individual demand curve. The individual demand curve reflects the maximum price that the consumer is willing and able to pay for that particular unit of good or service, which is equivalent to the satisfaction he or she can derive from that unit.
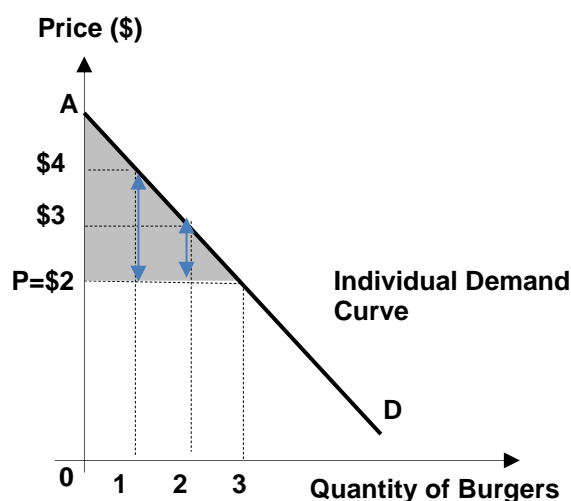
Figure 20: Consumer Surplus of An Individual Consumer

Graphically, the height of the individual demand curve shows the maximum willingness to pay at each quantity. With reference to Figure 20, Benny is willing to pay $4 for the first burger, $3 for the second burger and $2 for the third burger, due to diminishing marginal utility. At a market price of $2, Benny will buy 3 burgers to maximise his satisfaction. Since Benny pays a uniform price of $2 for all three burgers, the difference between his willingness to pay and the amount he actually paid is $2 for the first burger and $1 for the second burger.

It represents a gain to Benny as he pays less for the burgers than he had been prepared to pay. The total consumer surplus for Benny is $2+$1 =$3.

Total consumer surplus is the sum of the consumer surplus of all buyers. **Graphically, the consumer surplus in the market is the area beneath the market demand curve and above the equilibrium price,** as represented by the area P$_e$AC in Figure 21.

P_e = market price = $2.00
Area $0ACQ_e$ = total amount consumers are willing and able to pay to purchase Q_e (1)
Area $0P_eCQ_e$ = total amount actually paid for Q_e (2)
Area P_eAC = consumer surplus [(1) – (2)]
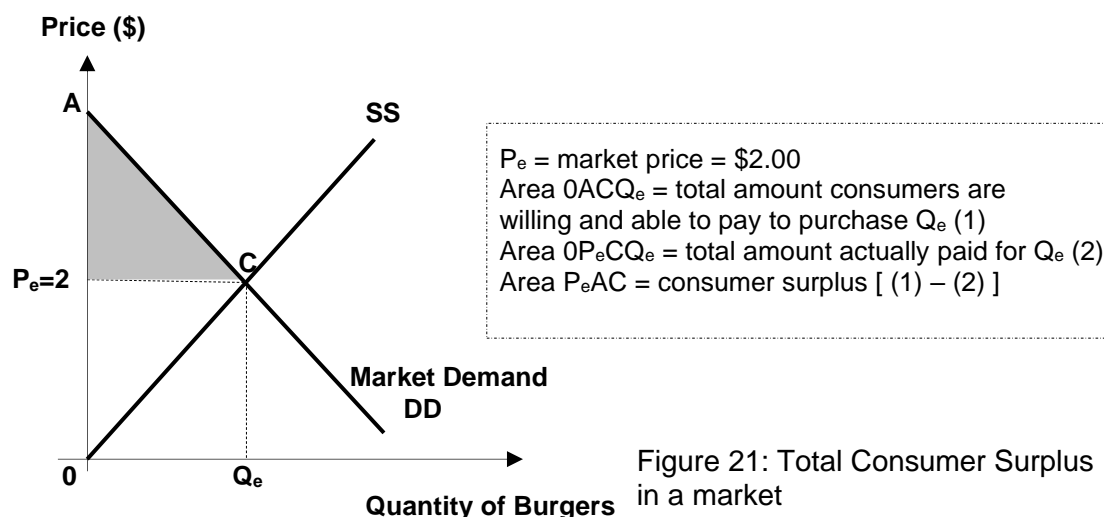
Figure 21: Total Consumer Surplus in a market

Self-Assessment 7:

When there is a technological advancement in the ice cream industry, consumer surplus in that market will
   a) Increase.
   b) Decrease.
   c) Not change, since technology affects producers and not consumers.
   d) Not change, since consumers' willingness to pay is unaffected by the technological advance.

5.2 Producer Surplus

Definition:
Producer surplus is the **difference** between the amount producers actually receive for a good or service and the minimum amount they are willing and able to accept for it.

The producer surplus represents a gain to producers as they receive more for a good or service than they had been prepared to accept.

To understand the concept of producer surplus, let us start with the individual supply curve. The individual supply curve reflects the minimum price that the producer is willing and able to accept to produce that particular unit of good or service, which is equivalent to the marginal cost of production.
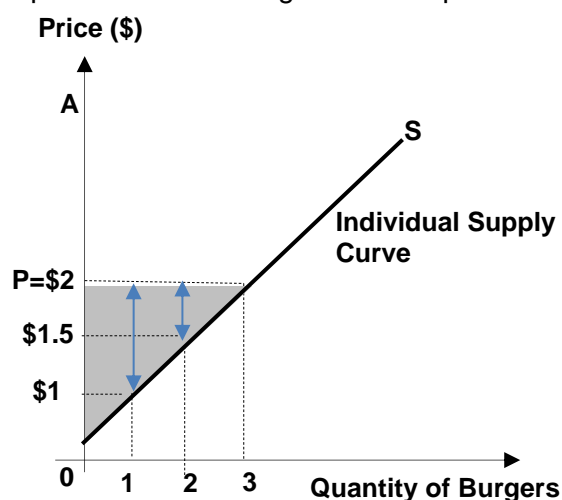
Figure 22: Producer Surplus of An Individual Producer

Graphically, the height of the individual supply curve shows the minimum price the producer is willing to accept at each quantity. With reference to Figure 22, Firm A is willing to accept $1 to produce the first burger, $1.50 for the second burger and $2 for the third burger, due to increasing marginal cost. At a market price of $2, Firm A will produce 3 burgers to maximise profit. Since Firm A is paid a uniform price of $2 for all three burgers produced, the difference between the firm's willingness to accept and the amount actually received $1 for the first burger and $0.50 for the second burger.

It represents a gain to Firm A as it receives more for the burgers than it had been willing to accept. The producer surplus for Firm A is $1+$0.50 =$1.50.

Total producer surplus is the sum of the producer surplus of all producers. **Graphically, the producer surplus is the area above the market supply curve and beneath the equilibrium price,** as represented by the area Area $0P_eC$ in Figure 23.

P_e = market price = $2.00
Area $0CQ_e$= total amount producers are willing and able to accept to sell Q_e (1)
Area $0P_eCQ_e$= total amount actually received for Q_e (2)
Area $0P_eC$ = producer surplus [(1) – (2)]
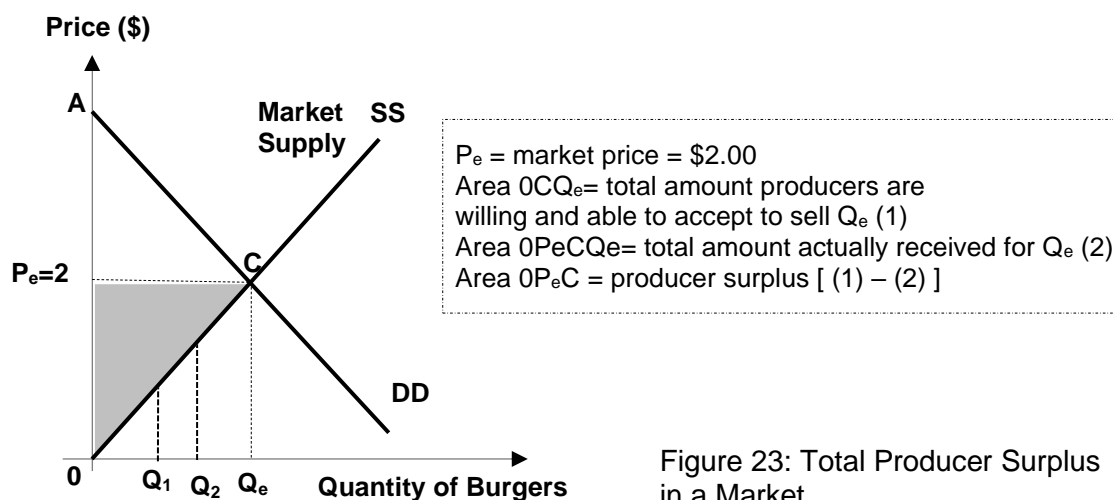
Figure 23: Total Producer Surplus in a Market

Note: When demand and/or supply changes, consumer and producer surplus will change accordingly.

The concept of consumer and producer surplus is useful in analysing the impact of government intervention and economic issues on consumers, producers and societal welfare.
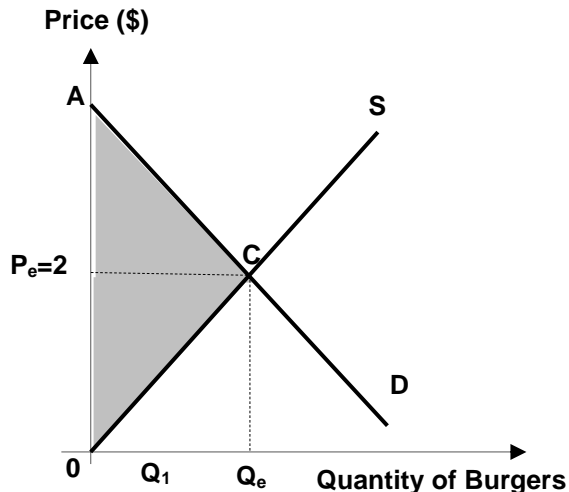
Figure 24: Economics Welfare

The sum of consumer and producer surplus represents economic welfare. Welfare is the total benefit available to society from an economic transaction. It is represented by the area AC0 in Figure 24, which is made up of the area for consumer surplus, AP_eC plus the area for producer surplus, $0P_eC$.

In the free market, due to the assumptions made, e.g. perfect competition and no externalities, we assume that there is allocative efficiency in the market as long as consumer and producer surplus are maximised. Consumer and producer surplus may not be maximised when governments implement price controls (Section 8.1).

Self-Assessment 8:

Jones was selling his house. The asking price was $220,000 and Jones decided he would take no less than $200,000. Jones finally sold the house at $205,000. Jones' producer surplus is

(a) $5,000.
(b) $15,000.
(c) $20,000.
(d) Not able to be calculated from the information given.

---

6 Demand & Supply in the Factor (Resource) Market

So far, we have discussed demand and supply in the product market, i.e. the market for final goods and services that are typically bought by regular consumers. Goods and services are also produced by factors of production (i.e. resources) in the factor market – land, labour, capital and entrepreneurship and bought by firms to produce output.

Changes in demand and/or supply for these factors would also have an impact on the market equilibrium price and quantity of these factors.

This section will focus on one of the factors of production – the labour market and the determination of wages.

6.1 Wage Determination in the Labour Market

In the labour market, **firms are the consumers that demand labour for production** and **households are the 'producers' that supply their labour to firms**.

Labour is not demanded for its own sake. The demand for labour comes from the demand for the final goods/services produced by labour. In other words, the demand for labour is a **derived** demand i.e. demand for a resource that is derived from the demand for final products produced by the resource.

A change in the demand for the final product causes a similar change in the demand for the relevant resource. E.g. an increase in demand for cars leads to an increase in demand for steel and automobile workers that are needed for the production of cars.

Market demand for labour

To derive the **market demand for labour**, we can sum up all the individual firm' demand for labour. This is the same idea as in the product market mentioned previously.

The market demand curve for labour shows the number of workers demanded (Q_d) by all firms in the market at each wage rate.

The market demand curve for labour is downwards sloping. As the wage rate falls, firms are more willing and able to employ labour, therefore the quantity demanded for labour increases.

Market supply for labour

To derive the **market supply of labour**, we can sum up all the individual labour supply. This is the same idea as in the product market mentioned previously.

The market supply curve for labour shows the quantity of labour supplied (Q_s) by all households in the market at each wage rate.

The market supply curve of labour is upwards sloping. As the wage rate rises, workers are more willing and able to provide labour.

> **Definitions:**
> **Wage rate** is defined as the compensation for labour (mental and physical efforts of workers) per period of time (man-hours).
>
> **Wages** are the total payments for the services rendered by labour.

Assume we are now looking at the labour market for sales assistants. Firms (e.g. shopping malls or fashion boutiques) demand sales assistants while individuals (or households) supply their labour services.

With reference to Figure 25, at the market equilibrium, Point E, where $Q_d=Q_s$, the equilibrium (market-clearing) wage rate is at W_e and the equilibrium quantity of labour is at Q_e.

> *Note: The labelling of the vertical axis in the labour market is **'wage rate' – not 'price'**.*
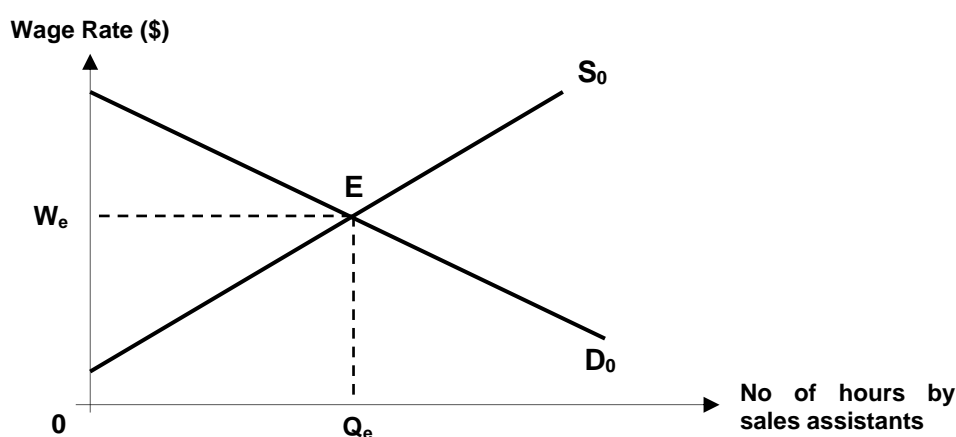
Figure 25: Equilibrium in the Labour Market

Changes in the demand and/or supply or labour will cause changes in the equilibrium wage rate and equilibrium quantity of labour. The next two sections will examine the determinants that will cause demand and supply of labour to change.

6.2   Determinants of Demand for Labour

6.2.1   Demand for the Final Product

Since the demand for labour is **derived** from the demand for final products, any change in the demand for the final product affects labour demand. *(See Section 2.6.2 to recap 'Derived Demand')*

The higher the market demand for the final good or service, the higher will be the market price, ceteris paribus.

Since firms are assumed to be profit motivated, they will now desire to sell more (increase quantity supplied) of the good in the market, hence increasing their demand for labour in order to produce more of the good or service.

For example, an increase in the demand for cupcakes increases their market price ceteris paribus. In turn, this increases the demand for labour input in terms of man-hour from pastry chefs.

6.2.2 Productivity of Labour

When labour becomes more productive, i.e. being able to produce more output per man-hour, labour becomes more attractive to hire compared to capital. As a result, profit-maximising firms may switch from using capital, e.g. machines, to using labour in their production, therefore increasing demand for labour.

Education and on-the-job training can enhance labour productivity and increase the chances of employment due to increased market demand.

This explains the Singapore government's initiatives in urging older or retrenched workers to be retrained and be upgraded in their skills.

6.2.3 Technology

Technological change can affect the demand for labour in different ways. When productivity of labour increases due to technology (labour – augmenting technology), the demand for labour increases. For example, the computerisation of production lines increased the demand for computer – trained machinists or engineers.

However, technological improvements may also make some types of labour obsolete (labour – saving technological change). In these cases, it may be hard to determine the effect on the demand for certain type of labour. For example, self-service kiosks are replacing cashiers at fast food chains in countries where labour is expensive.

6.2.4 Price and availability of substitute input

Similar to demand for final goods and services, demand for a given factor input depends in part on the price of its substitute factor input. For example, when capital, e.g. machines, becomes more expensive, firms will find it more attractive to hire labour and switch from capital-intensive method of production to a labour-intensive one. As a result, the demand for labour increases.

6.3 Determinants of Supply for Labour

6.3.1 Number of Qualified People

With training and education, people gain the skills required by the labour market. As a result, supply of qualified labour increases and the market labour supply curve shift to the right.

For example, an increase in the university intake for medicine would result in an increase in the supply of doctors once these students graduate.

6.3.2 Non-Wage Component (Benefits or Costs)

In any job, there are both monetary and non-monetary aspects that affect people's willingness to enter the job market and be part of the labour force. This will affect the supply of labour.

For example, non-monetary aspects to a job could include a pleasant working environment, job satisfaction or dissatisfaction, fringe benefits (medical) etc.

If a job came with more non-wage benefits (e.g. holidays/ perks/ fringe benefits etc.), then it would likely encourage more people to supply their labour and enter the job market.

On the other hand, if the working conditions worsens (e.g. lower status/ more inconvenient hours or shift work etc.), the supply of labour would likely to fall as more people will withhold from entering the labour force and job market.

6.4   Wage Differentials

In theory, assuming all jobs are alike and all workers are alike (homogeneous condition), as long as workers and firms can freely enter or exit the marketplace, there will be a single equilibrium wage rate across all jobs.

This is because higher wage rates in one industry (e.g. Industry B) will attract workers from another industry (e.g. Industry A), increasing the supply of labour in Industry B and exerting downward pressure on the wage rate in Industry B. The wage rate in Industry A will rise with the decreased supply of labour while the wage rate in Industry B will fall with the increased supply. This movement of labour across Industry B and A will continue until wage rates in both industries are equal.

However, this is not seen in reality, i.e. wage differentials do exist in the real world because the assumption of homogeneous condition does not hold. Workers differ in their skills while jobs differ in their requirements. With reference to the earlier example in Figure 24, it is may not be possible for workers in Industry A to move over to Industry B despite the higher wages in Industry B for various reasons, e.g. lack of appropriate skills.

6.4.1   Types of Wage Differentials

Wage differentials could exist:
- Within a particular industry (intra-industry)
    - » E.g. Chef in a 5-star Hotel vs Chef in a 3-star Hotel

- Among different industries (inter-industry)
    - » E.g. Chef in F&B industry vs Banker in Financial industry

6.4.2   Reasons for Wage Differentials

a) Labour immobility
In reality, it is often not easy for workers to move from one industry to another. This could be due to geographical or occupational immobility.
- Geographical immobility occurs because people may have difficulty moving from one job to another in a different part of the country (e.g. strong family ties and long geographical distances may make them reluctant to move). E.g. wages in wages cities in the south of UK, like London, tend to be higher than those in the north of UK, like Newcastle.
- Occupational immobility occurs when people cannot move from one type of job to another due to the lack of relevant skills (e.g. a worker without IT skills will not be

able to move to an IT-intensive industry). E.g. wages in high-skilled job markets tend to be higher than lower-skilled job markets.

•
• **b) Non-Monetary Factors**
Some jobs might be more dangerous or unpleasant, e.g. jobs that require irregular or inconvenient working hours. In such cases, a higher wage is required to take account of this difference in factors.

Such differences in wage are known as 'compensating wage differentials'.

c) Imperfect Information
Firms and employees very often suffer from poor information in the labour market and they do not know the availability of suitable candidates or jobs that exist in certain industries, as well as the wages offered by different firms. In such cases, this lack of information prevents the workers from switching jobs as they are unable to compare and decide if the new job may potentially offer higher wages. As such, the greater the imperfect information, the larger the wage differentials observed.

7 Role of Price Mechanism in Resource Allocation in a Free Market Economy

Recall: In the previous topic on Central Problem of Economics, it was discussed that in any economic system, scarce resources have to be allocated among competing uses. The price mechanism allocates scarce resources in the free market through signaling, incentive and rationing functions

a) **Signaling function:** Changes in prices provide information to producers and consumers about changes in market conditions. For example, if prices are rising due to higher demand, this is a signal to producers to expand production.

b) **Incentive function:** Changes in prices provide incentives for producers to reallocate their scare resources. For example, rising prices act as an incentive for producers to allocate more resources to earn more profits.

c) **Rationing function:** Changes in prices enable scarce resources to be rationed to the parties who are most willing to pay. For example, when there is a shortage, those with greater willingness and ability to pay will bid up the price of the good, thus enabling the goods to be rationed to these buyers.

Additionally, the explanation for the next section will be structured as a sample essay to the following question:

Explain how the price mechanism allocates scarce resources.

Introduction
Due to the limited amount of resources to cater to humans' unlimited wants (i.e. scarcity), there is a need to decide how to allocate resources among competing wants to maximise society's welfare. This is done by addressing the three central questions of 'what and how much to produce', 'how to produce' and 'for whom to produce'. In a **free market economy**, the basic coordination and communication system to allocate scarce resources will be the **price mechanism.** Prices determine how much of the good consumers choose to purchase and how much producers choose to produce. Therefore, prices act as signals to producers to adjust allocation of resources to

production, until any prevailing surpluses or shortages are removed. The section below illustrates one particular scenario when the price mechanism restores the market equilibrium with the price adjustment process.

Thesis 1: Answering the resource allocation question of 'what and how much to produce'

The free market uses prices as signals in deciding **what and how much to produce** to ensure that society's welfare is maximised as the goods that society value more are produced in higher quantity. This achieves allocative efficiency. In the free market, consumers reflect their willingness and ability to purchase a particular good through price. They will bid up prices of the good that they value more to maximise utility. When consumers value a good more than before due to a change in tastes and preferences, demand for it increases and hence price increases, ceteris paribus. For example, if there's a higher demand for smartphones from D_0 to D_1, there will be a shortage of Q_0Q_2 at P_0 (Figure 26). In response to the shortage, consumers will compete among themselves and bid up the price.

Figure 26: Increase in Demand for smartphones
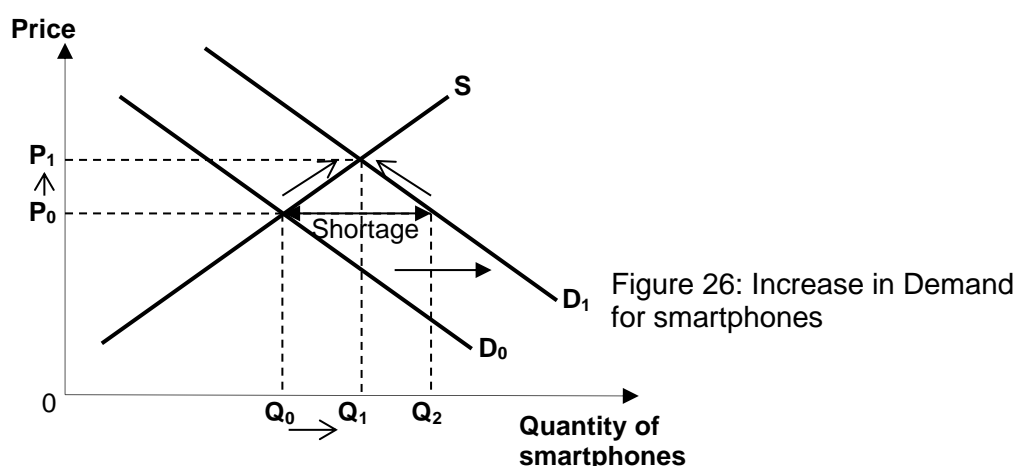
Due to the upward pressure on price, producers, being profit-driven, would be more willing to allocate more resources, e.g. labour to the production of smartphones. Therefore, producers will channel more labour from the production of other electronic products to increase the Q_s of smartphones from Q_0 to Q_1.

At the same time, the increase in prices will cause consumers to reduce the Q_d of smartphones from Q_2 to Q_1. The shortage will be cleared, and there will therefore be a higher equilibrium quantity and price of smartphones, as indicated by Q_1 and P_1 respectively.

Therefore, the **signaling function** can be seen that the price mechanism uses the changes in prices to provide information to producers and consumers about changes in market conditions. The **incentive function** can also be seen in how changes in prices provide incentives for producers to reallocate their scare resources.

Thesis 2: Answering the resource allocation question of 'how to produce'

In producing more of the goods that fetch relatively higher prices in the market, there is also a need to decide which factor input combination to adopt to produce the desired output. In the free market, producers would consider the relative price of labour and capital, and they would adopt the least-cost production technique so that, for a given price, they would get the maximum profit. So labour and capital would be employed in

a combination that incurs the least opportunity cost to produce a given output. More output would be generated per unit of input, hence achieving <u>productive efficiency</u>, i.e. a given output is produced at the least possible cost.

<u>Thesis 3: Answering the resource allocation question of 'for whom to produce'</u>
Because of the competing wants, there is also a need to decide who gets the products produced. Those who value a good more would be willing to pay more for it. Producers would therefore distribute the goods to those who are willing and able to pay more for it as they also seek to get the highest revenue possible out of the products produced. As the final products produced will be obtained by those whose valuation of the good is higher, the price mechanism ensures that allocative efficiency is achieved.

This demonstrates the **rationing function** of the price mechanism. Changes in prices enable scarce resources to be rationed to the parties who are most willing to pay. For example, when there is a shortage, those with greater willingness and ability to pay will bid up the price of the good, thus enabling the goods to be rationed to these buyers.

<u>Conclusion</u>
Theoretically, the price mechanism ensures that resources are optimally allocated to produce goods and services and distribute them to where they are most highly valued, therefore fulfilling the role of allocating scarce resources efficiently among competing wants in a free market economy.

8   Price Elasticity of Demand (PED)

In Section 2.2, we have learned that based on the Law of Demand, the quantity demanded of a product is inversely related to its price, e.g. when the price of a good increases, the quantity demanded of the good should fall.

In this section, we will use the concept of Price Elasticity of Demand (PED) to understand the *extent* to which a change in price of a good would change its quantity demanded, i.e. '***by how much***'.

8.1 Definition and Formula

Definition: Price elasticity of demand (PED) measures the degree of responsiveness of <u>quantity demanded</u> of a good to a change in its <u>price</u>, ceteris paribus.

*Note: The change in price is the **cause**, while the change in quantity demand is its **effect**.*

Students should be careful to refer to 'quantity demanded' – not 'demand' – when using the concept of PED. This is because a change in the price of a good affects its quantity demanded – not demand.

FORMULA:

$$PED = \frac{\text{Percentage change in quantity demanded}}{\text{Percentage change in price}}$$

$$= \frac{\frac{\Delta Q}{Q} \times 100\%}{\frac{\Delta P}{P} \times 100\%} \quad = \quad \frac{\Delta Q}{\Delta P} \times \frac{P}{Q}$$

Where   Q = initial quantity demanded,
ΔQ = change in quantity demanded,
P = initial price,
ΔP = change in price

Based on the Law of Demand, price and quantity demanded are inversely related, hence the sign of <u>PED is **negative**</u>.

By convention, this negative sign is usually *ignored* when we consider the magnitude of PED, and we consider the absolute value, i.e. |PED|.

EXAMPLE:
If a 10% increase in the price of petrol leads to a 2% reduction in the quantity demanded, then the price elasticity of demand for petrol is:
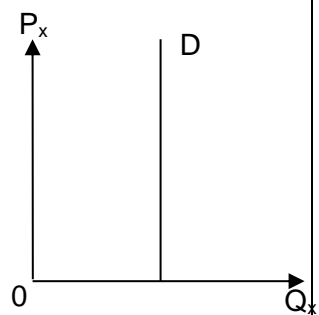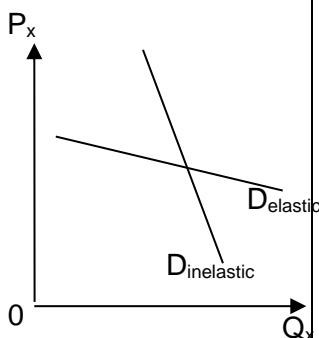
$$PED = \frac{-2\%}{10\%} = -0.2$$
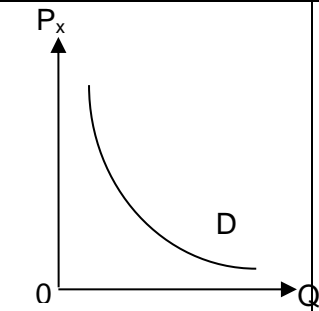
This means that a quantity demanded of petrol will decrease by only 0.2% in response to a 1% increase in the price of petrol. In other words, a change in price of petrol leads

to a less than proportionate change in quantity demanded of petrol, i.e. *quantity demanded of petrol is not very responsive to a change in its price*.
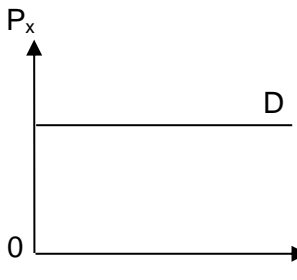
The absolute value of PED shows the responsiveness of consumers to price changes of the product itself. The larger the coefficient, the greater the sensitivity of quantity demanded to a price change.

> *Note: PED measures the extent of change in quantity demanded of a good to a change in its price – i.e. the change in price is the '**cause'**, while the change in quantity demanded is the '**effect'**.*

8.2 Degrees of Price Elasticity of Demand

PED Value	Interpretation	Diagram
PED = 0	Demand is perfectly price inelastic – *No change* in quantity demanded in response to a change in price, ceteris paribus. The same quantity is demanded regardless of the price of good, e.g. the quantity demanded of drug addicts for illegal drugs may be unresponsive to changes in price.	
PED < 1	Demand is price inelastic – A change in price leads to a <u>less than proportionate</u> change in quantity demanded, ceteris paribus. e.g. the quantity demanded of drivers for petrol may not be very responsive to changes in price of petrol due to the lack of alternatives.	
PED > 1	Demand is price elastic – A change in price leads to a <u>more than proportionate</u> change in quantity demanded, ceteris paribus e.g. the quantity demanded of air-travel by leisure travellers is very responsive to changes in price since they are constantly seeking for cheaper travel deals.	
PED = 1	Demand is unitary (unit) price elastic – A change in price leads to a *proportional* (equivalent) change in quantity demanded, ceteris paribus. The curve is a rectangular hyperbola.	

PED = ∞	Demand is infinitely or perfectly price elastic – A very minimal change in price leads to an *infinite large* change in quantity demanded. An infinitely small increase in price will cause quantity demanded to fall infinitely to zero.	P_x D 0 $\qquad\qquad Q_x$

*Note: In this syllabus, we tend to focus on the cases where demand is **price elastic (PED>1) and price inelastic (PED<1)** as the others are seldom observed in reality.*

Students should specify whether the PED of a good is 'more/ less than one' – rather than 'high /low' – to show whether a given change in price would lead to a more/ less than proportionate change in quantity demanded.

8.3 Determinants of PED

In this section, we will look at some factors that will influence the PED of a good, i.e. determinants of PED. These factors will give us an idea of whether the demand for a good is likely to be price elastic or price inelastic.

a) Degree and availability of substitutes

Recall from previous topic: substitutes in consumption are goods that can be used in place of one another for the satisfaction of a particular purpose/want i.e. goods which are alternatives to each other.

The greater the availability of substitutes, the more price elastic the demand would be.

*Note: We are referring to the **'degree of availability of substitutes'** when analysing the PED of a good – not the 'change in price of substitutes'.*

'Change in price of substitutes' is a factor that we had analysed under Cross Elasticity of Demand (XED) [Section 2.6.2].

This is because consumers have more options and hence can easily switch to these substitutes when the price of the good rises, leading to a more than proportionate fall in the quantity demanded of this good. Similarly, when the price of a good falls, consumers will quickly switch over and buy this good instead, resulting in a ***more than proportionate*** rise in its quantity demanded.

The closer the substitutes available, the higher the price elasticity of demand for the good. This is because consumers would more readily switch to buying its substitute, which can easily satisfy the same purpose/want.

Hence, goods with ***many close substitutes*** tend to have a ***price elastic demand*** while goods with no close substitutes tend to have a ***price inelastic demand***.

For example, there are many close substitutes for a brand of low-fat milk. Should the price of a particular brand of low-fat milk rise relative to other brands of low-fat milk, ceteris paribus, consumers can easily switch to numerous cheaper substitutes.

Therefore, the PED for a particular brand of low-fat milk is *greater than one*, i.e. the particular brand of low-fat milk has a *price elastic demand*.

How a good is defined also affects the availability of substitutes

The number and closeness of substitutes depend on how we define the good. The ***more widely defined*** the good, the fewer the number of substitutes, **the lower the value of PED**, and the demand for the good would likely be price inelastic.

For example, 'vegetables' are more widely defined than 'broccoli'. There are almost no alternatives to vegetables if we wish to eat it. However, we can choose *kai lan*, spinach or cauliflower instead of broccoli.

Therefore, PED for vegetables is likely to be less than one (price inelastic demand) and the PED for broccoli likely to be more than one (price elastic demand).

b)   Proportion of income spent on the good

The proportion of income that consumers spend on a good can affect their responsiveness to price changes of the good. The higher the proportion of consumers' income that is spent on a good, the more consumers will be forced to cut consumption of the good when its price rises, and hence the more price elastic will be its demand. This is because a given increase in its price will take up a large proportion of the consumer's available income and hence have a substantial impact on the quantity that consumers are able and willing to consume.

Consider the case of housing which take up a large proportion of consumers' income and hence has a ***price elastic demand***. Even a small percentage increase in the price of housing would imply a substantial surge in financial burden on the households and forces consumers to reduce consumption (i.e. quantity demanded). Therefore, quantity demanded falls ***more than proportionately*** when housing price rises.

In contrast, the lower the proportion of consumers' income that is spent on a good, the more ***price inelastic its demand*** would be. This is because consumers would spend such a tiny fraction of their income on the good that they will find little difficulty in paying a relatively large percentage increase in its price. E.g. Tissue paper has a very low price elasticity of demand because even a large percentage increase in its price would constitute only a small proportion of consumers' income, and would lead to a ***less than proportionate*** fall in quantity demanded.

c)   Time period

Consumers require time to respond to a price change, adjust their consumption pattern, and look for alternatives. Therefore, the longer the time period, the more likely consumers would adjust their consumption pattern, and switch to other substitutes.

- **Time for discovery of new substitutes and adjusting consumption patterns**

Time is needed for the development or discovery of substitutes. Therefore, in the long run, new substitutes can be developed or created, causing demand to become relatively more price elastic. Therefore, consumers are more responsive to price changes in the long term than in the short term.

For example, if petrol prices increase, people will find it difficult to significantly reduce their consumption of petrol by driving less frequently in the short run. Even if there were alternatives to driving such as public transport and electric cars. People take time to adjust because a switch to public transport represents a change in lifestyle, whereas a switch to electric cars requires a replacement of their vehicles and learning how to operate the new electric car. However, with time, they will adjust and find more ways to respond, e.g. purchasing more fuel-efficient cars, use GrabHitch or even move closer to work. Therefore, in the longer-term demand would tend to be more price elastic.

d) Habit-Forming Goods / Addictive Goods/ Necessities

Some goods, such as cigarettes and alcohol, are habit-forming and addictive. Time is needed for consumers to change their consumption habits. In such cases, demand will tend to be price inelastic in the short run. Similarly, rice is a staple and necessity in many Asian societies and consumed on a habitual basis. If someone were to move to USA, time is needed for Asians to change their consumption habits as rice is not a staple food there.

Summary Table for Determinants of Price Elasticity of Demand (T.H.I.S.)	
T	**T**ime Period
H	**H**abit-forming goods/ Addictive goods/ Necessities
I	Proportion of **I**ncome spent
S	Degree and availability of **S**ubstitutes

8.4 Importance of PED

One of the most important uses of PED is to determine the **extent of equilibrium price and quantity fluctuations given a change in <u>supply</u>.**

In explaining the use of PED here, we need to first identify the supply factor(s) leading to changes in equilibrium price and quantity.

Change in Supply	PED	Change in equilibrium price (Pe)	Change in equilibrium quantity (Qe)	Scenarios
↑ Supply	PED>1	Limited ↓ Pe	Sharp ↑ Qe	Scenario 1 (Figure 2a)
	PED<1	Sharp ↓ Pe	Limited ↑ Qe	Scenario 2 (Figure 2a)
↓ Supply	PED>1	Limited ↑ Pe	Sharp↓ Qe	Scenario 3 (Figure 2b)
	PED<1	Sharp ↑ Pe	Limited ↓ Qe	Scenario 4 (Figure 2b)

*Note: PED does not affect the **directional change** in Pe and Qe when supply changes, e.g. when supply increases, Pe will decrease and Qe will increase regardless of PED value, ceteris paribus.*

*PED affects the **extent** to which Pe and Qe change when they are brought about by changes in supply.*
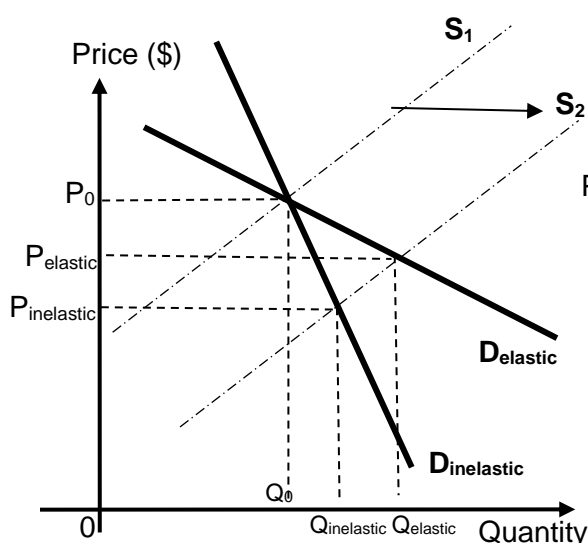
Figure 27a: Increase in Supply with PED>1 & PED<1 [Scenarios 1 & 2]
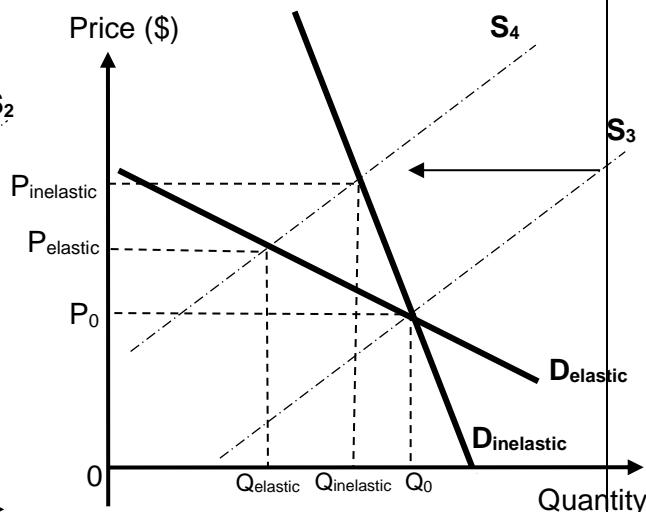
Figure 27b: Decrease in Supply with PED>1 & PED<1 [Scenarios 3 & 4]

In Figure 27a, there is an **increase in supply** from S_1 to S_2. This could be caused by changes in non-price determinants of supply, for example, a fall in the price of factor input.
- When demand is **price elastic** at $D_{elastic}$, there will be a limited fall in equilibrium price from P_0 to $P_{elastic}$ and a sharp increase in equilibrium quantity from Q_0 to $Q_{elastic}$.
- However, when demand is **price inelastic** at $D_{inelastic}$, the same increase in supply from S_1 to S_2 will see price fall significantly from P_0 to $P_{inelastic}$. There will be a limited increase in equilibrium quantity from Q_0 to $Q_{inelastic}$.

In Figure 27b, there is a **decrease in supply** from S_3 to S_4. This could be caused by adverse weather conditions like droughts.
- When demand is **price elastic** at $D_{elastic}$, there will be limited increase in equilibrium price from P_0 to $P_{elastic}$. Equilibrium quantity decreases significantly from Q_0 to $Q_{elastic}$.
- However, when demand is **price inelastic** at $D_{inelastic}$ the same decrease in supply from S_3 to S_4 will see price rise to a larger extent from P_0 to $P_{inelastic}$. There will be a limited decrease in equilibrium quantity from Q_0 to $Q_{inelastic}$.

*Note: Students tend to be confused about when to use PED to analyse the extent to which Pe and Qe change. As a rule of thumb, **PED** should be used to analyse the extent to which **changes in supply** change Pe and Qe, ceteris paribus.*

Diagrammatically, gradient of the demand curve along which the supply curve shifts – represented by PED, informs us of the extent of the resultant change in Pe and Qe.

8.5 Relationship between PED and Total Revenue/Total Expenditure

> **Definition:** Total Revenue (TR) refers to the total receipts or total earnings received by producers from the sale of goods and services.

TR can be calculated simply as the price of the good (P) multiplied by the quantity demanded at that price (Q),

$$TR = P \times Q$$

> *Note: Since TR is the total earnings received by producers from consumers, the total expenditure (TE) by consumers to producers should be of an equal value or amount.* ***Therefore, TR=TE.***

There is a positive relationship between demand and TR.

When there is a change in demand for a good, the equilibrium price (Pe) and equilibrium quantity (Pe) of this good should both increase, ceteris paribus. Therefore, since TR = P x Q, an increase in demand should increase TR of a good, ceteris paribus. This is also true when there is a change in both demand and supply, **but** the **change in demand is greater** than the change in supply.

In summary, there is a direct relationship among demand, equilibrium price, equilibrium quantity, TR and TE, e.g.:

$$\uparrow \text{Demand} \to \uparrow \text{Pe and} \uparrow \text{Qe} \to \uparrow \text{TR (ceteris paribus)}$$

However, there is an <u>ambiguous</u> relationship between supply and TR.

When there is an increase in supply, the equilibrium price (Pe) of a good falls but the equilibrium quantity (Qe) increases, ceteris paribus. Conversely, a fall in supply causes the equilibrium price (Pe) of a good to increase, but the equilibrium quantity (Qe) to fall, ceteris paribus. In this case, we cannot definitively conclude how a change in supply would change TR since Pe and Qe would change in opposite directions. This is also true when there is a change in both demand and supply, **but** the **change in supply was greater** than the change in demand.

In summary, there is an ambiguous relationship between supply and TR, e.g.:

$$\uparrow \text{Supply} \to \downarrow \text{Pe \& } \uparrow \text{Qe (ceteris paribus)} \to \text{impact on TR is unclear.}$$

Whether TR increases or decreases as a result of a change in supply is dependent on the price elasticity of demand. **Therefore, the concept of PED is necessary when analysing how a change in supply would affect TR of a good.**

a) Price Elastic Demand (PED > 1)	b) Price Inelastic Demand (PED < 1)
When demand is price elastic (i.e. PED>1), quantity demanded (Qd) would change ***more than proportionately*** in response to a given price change brought about by **changes in supply**.	When demand is price inelastic (i.e. PED<1), quantity demanded (Qd) would change ***less than proportionately*** in response to a given price change brought about by **changes in supply**.
• When there is a **fall** in supply, Pe would *increase* and this would lead to a **more** than proportionate	• When there is a **fall** in supply, Pe would *increase,* and this would lead to a **less** than proportionate

decrease in Qd when PED>1, therefore TR will *decrease* overall.	*decrease* in Qd when PED<1, therefore TR would *increase* overall.
• <u>When there is an **increase** in supply</u>, Pe would *decrease* and this would lead to a **more** than proportionate *increase* in Qd when PED>1, therefore TR will *increase* overall.	• <u>When there is an **increase** in supply</u>, Pe would *decrease* and this would lead to a **less** than proportionate *increase* in Qd when PED<1, therefore TR would *decrease* overall.

The following diagrams illustrate how PED affects how TR changes when there is an increase and decrease of supply.
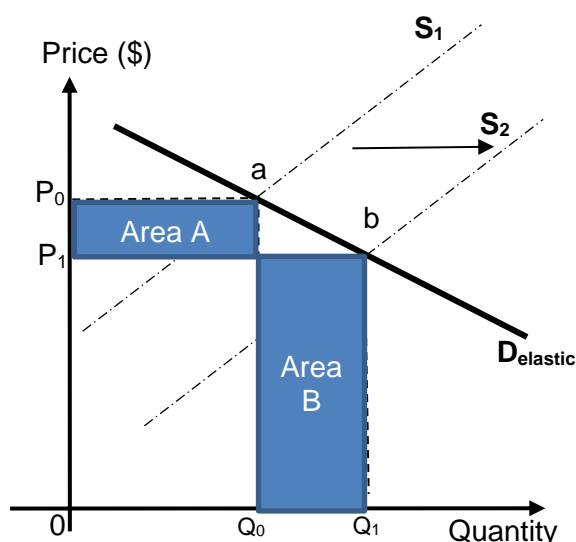
Figure 28a: Increase in Supply with PED>1, increase in TR

In Figure 28a, given that TR = P x Q, total revenue is initially given by area $0P_0aQ_0$ at the original equilibrium price and quantity of P_0 and Q_0.

When **demand is price elastic (D)**, an increase in supply from S_1 to S_2 would cause price to fall from P_0 to P_1 and quantity demanded to increase more than proportionately from Q_0 to Q_1. Thus, TR increases to $0P_1bQ_1$

This is because the <u>loss in TR due to the lower price given by Area A is less than the gain in TR due to the increase in quantity given by Area B</u>. Hence **total revenue increases**.
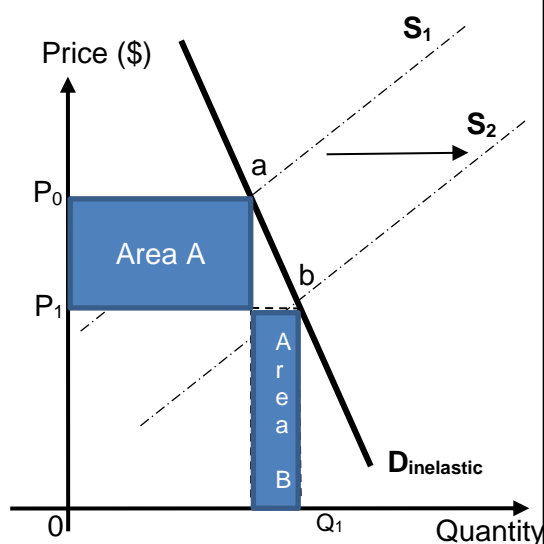
Figure 28b: Increase in Supply with PED<1, Decrease in TR

In Figure 28b, total revenue is initially given by area $0P_0aQ_0$ at the original equilibrium price and quantity of P_0 and Q_0.

When **demand is price inelastic (D)**, the same increase in supply would cause the price to fall from P_0 to P_1 and quantity demanded to increase less than proportionately from Q_0 to Q_1. Thus, TR decreases to $0P_1bQ_1$

This is because the <u>loss in TR due to the lower price given by Area A is greater than the gain in TR due to the increase in quantity given by Area B</u>. Hence **total revenue**
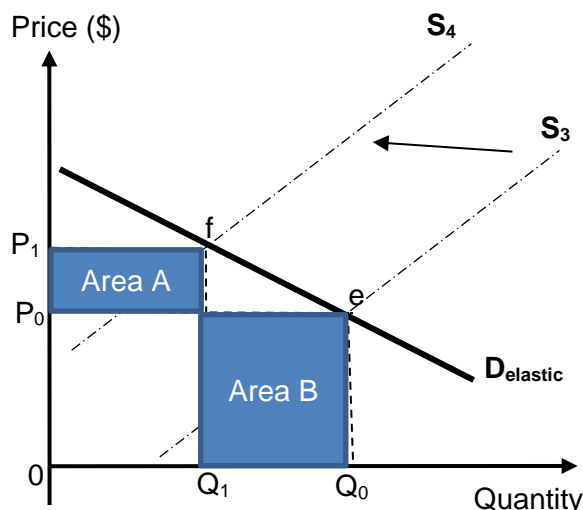
Figure 28c: Decrease in Supply with PED>1, decrease in TR

In Figure 28c, total revenue is initially given by area $0P_0eQ_0$ at the original equilibrium price and quantity of P_0 and Q_0.

When **demand is price elastic**, a fall in supply from S_3 to S_4 would cause price to increase from P_0 to P_1 and quantity demanded to decrease more than proportionately from Q_0 to Q_1. Thus, TR decreases to $0P_1fQ_1$

This is because the gain in TR due to higher price, given by Area A is less than the loss in TR due to the fall in quantity, given by Area B. Hence **total revenue decreases**.
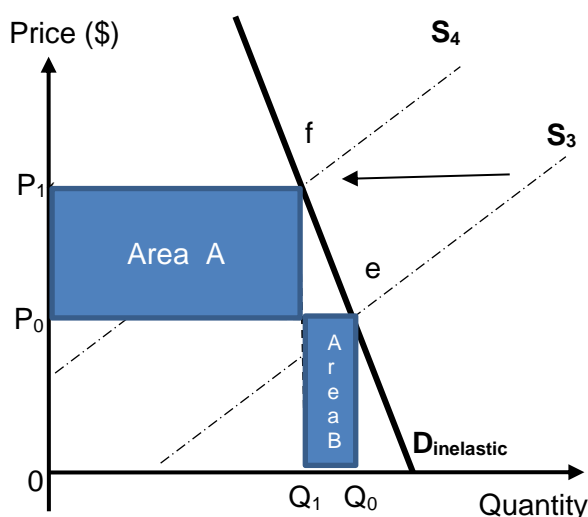
Figure 28d: Decrease in Supply with PED<1, changes in TR

In Figure 28d, total revenue is initially given by area $0P_0eQ_0$ at the original equilibrium price and quantity of P_0 and Q_0.

When **demand is price inelastic**, a fall in supply from S_3 to S_4 would cause price to increase from P_0 to P_1 and quantity demanded decreases less than proportionately from Q_0 to Q_1. Thus, TR increases to $0P_1fQ_1$

This is because the gain in TR due to higher price, given by Area A is greater than the loss in TR due to the fall in quantity, given by Area B. Hence **total revenue increases**.

8.6 Applications of PED for Producers

a) Pricing Strategies (whether to increase/ decrease price)

Pricing strategies refer to the necessary adjustments to price in order to achieve the objective of the producer. If the producer **aims to increase total revenue (TR)** in the hopes of maximising profit (assuming costs are constant), he will have to decide on a

price change which will allow him to achieve his aim. Once a desired price change is decided, produces can increase supply to induce a fall in price and decrease supply to induce an increase in price.

As seen in previous section, PED can be used to analyse the change in TR due to changes in supply. Whether a producer should raise or lower price in order to increase TR therefore depends on the PED of the good.

If the demand for a good is **price elastic:**	If the demand for a good is **price inelastic:**
the producer should **<u>lower</u>** its price to cause **Qd to increase <u>more</u> than proportionately** in order to increase TR.	the producer should raise its price to cause **Qd to decrease <u>less</u> than proportionately** in order to increase TR.

It is important that the producer should understand the PED of his good before making adjustments to price. To determine whether the demand for his good is relatively price elastic or inelastic, the producer will have to consider the various determinants of PED (refer to Section 8.3).

For example, in a supermarket, items like different brands of fruit juices are often sold at substantial discounts because the demand for them is very price elastic due to the wide availability of close substitutes.

b)   Marketing Strategies

It is likely that a producer would try to ***make the demand for his good less price elastic*** so that he is able to increase TR through a price increase subsequently.

Given that the degree of price elasticity is determined by the availability of close substitutes, one strategy is to ***reduce the substitutability*** by other products, i.e. to ensure that consumers will be less likely to switch to substitutes, when the price of the good increases.

Producers can ***create real or perceived differences*** between his product and the substitutes by introducing different features in his products or undertaking advertising. For example, calcium-fortified orange juice is less substitutable than generic orange juice.

> *Note: As part of a strategy using the concept of PED, marketing strategies must still be linked to producers' decision in terms of <u>pricing</u>.*
> *E.g. a strong marketing campaign can help to increase the uniqueness of a good and hence reduce its PED to be less than one. Therefore, the producer will then increase price to bring about a less than proportionate fall in Qd and hence an increase in TR.*

c)   Timing of decisions on pricing or marketing

Given that PED increases with time, producers should have different policies for different time periods.

- In the **short run** (when demand is <u>relatively</u> more price inelastic), producers can increase prices to increase TR. For example, the pricing of latest gadgets,

e.g. the newest model of iPhones, computer games, latest sneakers models, tend to be higher in the short run.

- In the **long run** (when demand is <u>relatively</u> more price elastic), producers can decrease prices to increase TR. For example, the prices of electronic products like TVs and cameras tend to fall in the long run due to increased competition and thus more substitutes.

However, in the long run, producers may not need to reduce prices if they are able to differentiate their products (making demand less price elastic) through product innovation, marketing and fostering brand loyalty.

8.7 Application of PED (Effects on Producers) – Agriculture Market

An example of large fluctuation in prices due to price inelastic demand and supply is in the **agriculture market**. The prices of agricultural products tend to *fluctuate* **widely** from year to year.

The reasons for these are:

1. The demand for agricultural products tends to be price inelastic in the short run as food and raw materials have few substitutes and many of these goods are necessities.

2. The supply of agricultural products tends to increase/decrease sporadically. This is due mainly to unexpected changes in the weather and incidences of diseases among animals and plants.

Combining these two factors, prices of these products tend to fluctuate significantly. Figure 29 below shows that for the same increase in supply, the price fall for an agricultural product is *greater* than that of a product with demand that is more price elastic, e.g. manufactured goods.
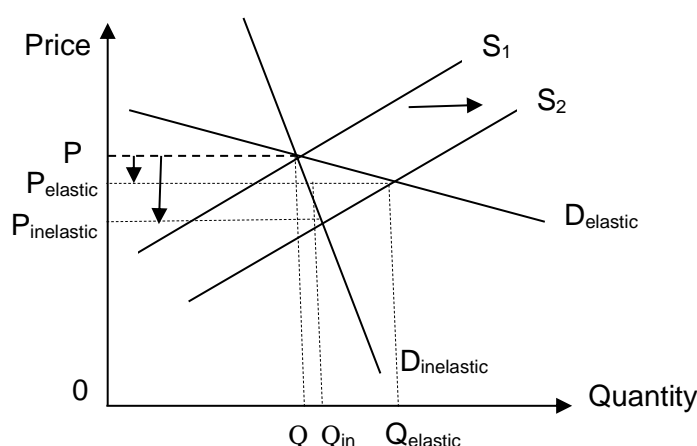
Figure 29: Fall in Price due to increase in supply in agricultural market

With an increase in supply from S_1 to S_2, we can observe a larger fall in price from P_0 to $P_{inelastic}$ in the case of agricultural goods where demand tends to be price inelastic ($D_{inelastic}$). In the case of manufactured goods where demand tends to be relatively more price elastic ($D_{elastic}$), the price would have fallen to a smaller extent, from P_0 to $P_{elastic.}$

This can have effects on income of farmers due to changes in prices leading to changes in quantity demanded. For example, if the demand is price inelastic, with an increase in supply, the increase in quantity demanded is less than proportionate than the fall in price, farmer's total revenue will drop. Thus, this is a form of negative impact on farmers' income.

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                              ┌─────────────────────────┐
                              │   Applications of PED    │
                              └─────────────────────────┘
        ┌──────────────────┐
        │ Effects on       │
        │ Producers        │
        │ (e.g. farmers)   │
        └──────────────────┘

        ┌──────────────┐                        ┌──────────────┐
        │  Producers   │                        │  Government  │
        └──────────────┘                        │ (Section 11) │
                                                └──────────────┘

  ┌──────────┐  ┌──────────┐  ┌──────────┐   ┌──────────┐  ┌──────────┐
  │ Pricing  │  │Marketing │  │ Timing on│   │ Raising  │  │ Reducing │
  │Strategies│  │Strategies│  │ decisions│   │ revenue  │  │consumption│
  └──────────┘  └──────────┘  └──────────┘   └──────────┘  └──────────┘
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Pricing Strategies	Marketing Strategies	Timing on decisions	Raising revenue	Reducing consumption
To max revenue: If PED > 1, lower prices If PED < 1, raise prices	Make PED < 1 through creating real or perceived differences Then raise prices	To max revenue: In short run, PED < 1, raise prices In long run, PED > 1, lower prices	To tax goods with PED < 1	To tax goods with PED > 1

9 Applications of YED and XED for producers

9.1   Applications of YED for producers

Knowledge of YED helps producers to decide on the types and amount of goods to produce or stock up on. Specifically, YED helps producers to estimate the future size of the market and potential changes in demand for their product in the following ways:

a) Production strategies

Should household incomes be rising (during economic boom) or are expected to rise, producers can:

i   Produce/ stock up more ***normal*** goods since demand for such goods will increase with a rise in income and therefore increase TR for producers. In particular, they may increase the stock of premium goods because the demand for ***luxury*** goods will increase more than proportionately in response to an increase in households' incomes (e.g. NTUC FairPrice can sell a wider range of organic and exotic food products).

ii   Expand existing number of retail outlets selling ***normal*** goods, especially ***luxury*** goods (e.g. NTUC FairPrice can increase the number of its FairPrice Finest outlets). The demand for these goods will increase – in particular for luxury goods – and therefore increase TR for producers.

Should household incomes be falling (during economic recession) or are expected to fall, producers can:

iii   Increase offering of goods which have negative income elasticities, i.e. ***inferior*** goods. (e.g. NTUC FairPrice can sell more budget house-brand items). When households' incomes falls, the demand for inferior goods will increase and producers who can switch to sell more of such products will see their TR increase. For other producers who cannot switch to producing inferior goods, they could at least sell more ***necessities*** that will see a less than proportionate fall in demand, and therefore the decrease in TR will be limited.

b)   Marketing strategies

Should household incomes be rising (during economic boom) or are expected to rise, producers can:

i   Use marketing strategies to alter consumers' perceptions and make the demand for their existing or new products more income elastic in demand, i.e. make them more luxurious. For example, renovating a beauty salon to make it more up-market, and offering more high-end services. NTUC FairPrice could use advertising campaigns to raise awareness of its more high-end offerings, and emphasise the premium quality of its products.

Should household incomes be falling (during economic recession) or are expected to fall, producers can:
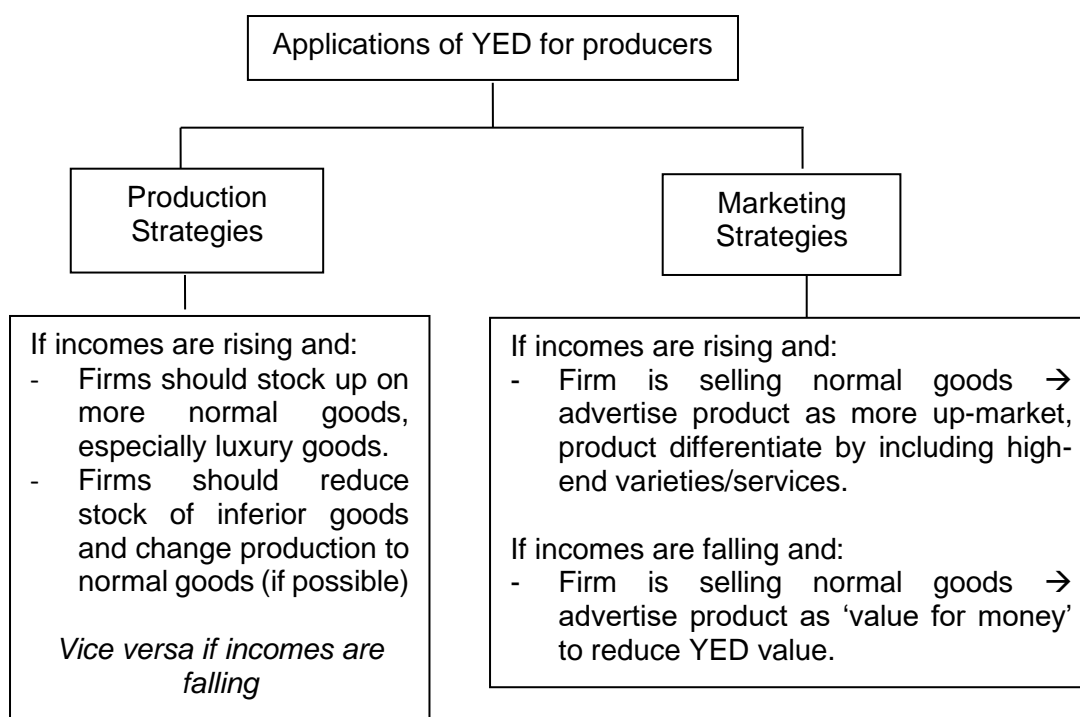
i   Promote products as '***value-for-money***' to appeal to budget-conscious consumers; and

ii   Focus marketing efforts on groups that view the good as essential.

> *Note: A common mistake by students when trying to apply the concept of YED to firms' strategies is to recommend that firms should cut prices during a recession (when households' incomes fall); and increase prices during an economic boom (when households' incomes rise).*
>
> *This is erroneous, because **YED strategies are not about pricing.***
> - *YED is about the responsiveness of demand to changes in income. Price changes affect quantity demand – not demand.*
> - *The concept of PED informs producers on their pricing strategies, while the concept of YED informs producers on their production and marketing strategies.*

Applications of YED for producers	
Production Strategies	**Marketing Strategies**
If incomes are rising and: - Firms should stock up on more normal goods, especially luxury goods. - Firms should reduce stock of inferior goods and change production to normal goods (if possible) *Vice versa if incomes are falling*	If incomes are rising and: - Firm is selling normal goods → advertise product as more up-market, product differentiate by including high-end varieties/services. If incomes are falling and: - Firm is selling normal goods → advertise product as 'value for money' to reduce YED value.

9.2   Applications of XED for producers

a) Responding to Rival Firms' Price Cuts

Firms want to know the effect on the demand for their product when there is a change in the price of a substitute (a rival's product with positive XED). XED helps producers decide whether to follow the price cuts of rival firms.

Magnitude of XED	Example & Implication	Strategy for producers based on XED
Close substitutes XED of a Firm X's product with respect to the price of Firm Y's product is positive and **greater than one.**	If Starhub cuts the price of its mobile plan, it would cause the demand for Singtel's mobile plan to fall more than proportionately as they are close substitutes. This would cause Singtel's TR to fall.	Based on the knowledge of XED, Singtel would likely choose to follow Starhub by cutting the price of its mobile plan. This would prevent Singtel's TR from falling. Singtel would not likely follow Starhub if Starhub raises price as it would likely cause the demand for Singtel's mobile plan to increase more than proportionately and hence increase its TR.
Weak substitutes XED of a Firm X's product with respect to the price of Firm Y's product is positive and **less than one**.	If Toastbox cuts the price of its coffee, it would likely only lead to a less than proportionate fall in the demand for Starbuck's coffee as they are weak substitutes. Therefore, the impact on Starbuck's TR would be limited.	Based on the knowledge of XED, Starbucks may opt not to follow Toastbox's price cuts as the impact on their TR would likely be limited.
*Note: A common mistake by students when trying to apply the concept of XED to firms' strategies is to recommend that firms should cut prices when there are rival firms. This is erroneous and shows a confusion with PED because **XED strategies are not about proactive pricing strategies**! The concept of PED informs producers on their proactive pricing strategies (i.e. whether to increase/decrease price), while the concept of XED informs producers on whether there is a need to follow a rival firms' price cut based on the closeness of the substitute (i.e. magnitude of XED)*		

b)   Marketing and Sales Strategies
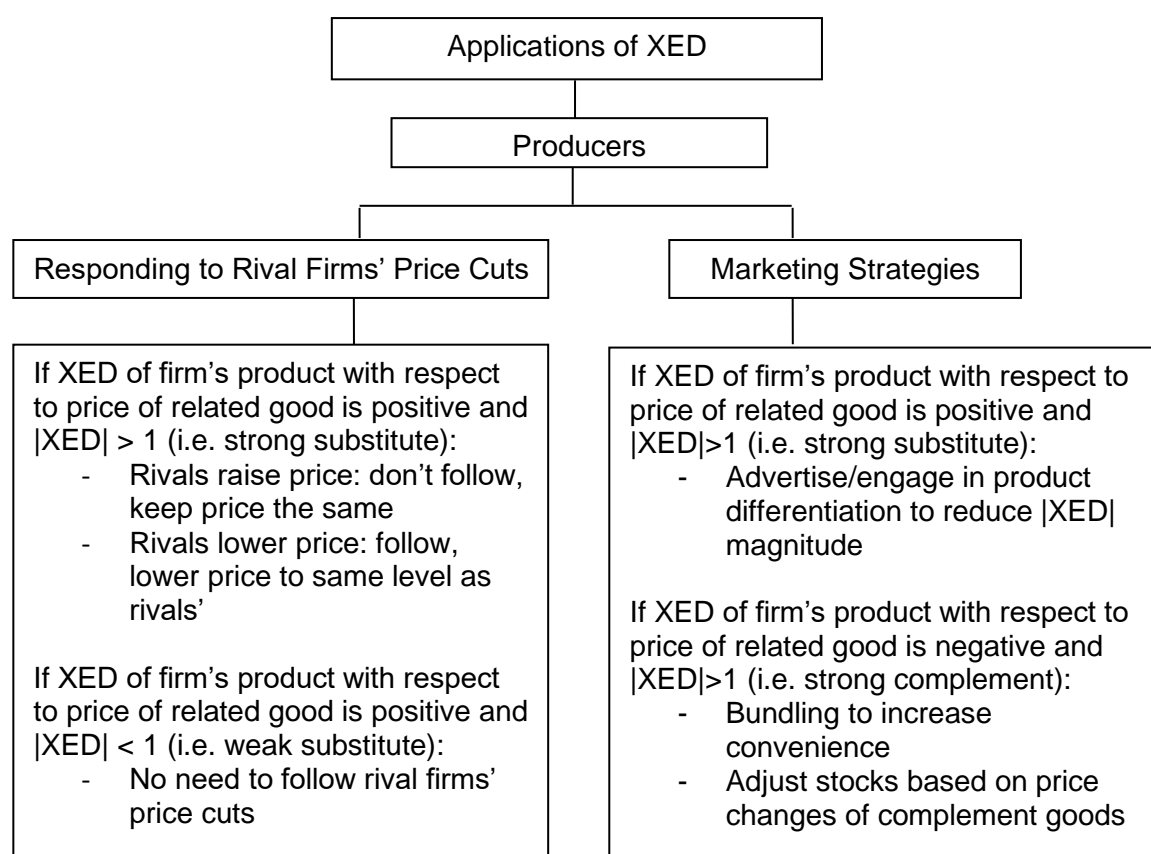
Increase uniqueness of product
The firm can try to make its products less substitutable and its demand less affected by the pricing policies of rival firms (i.e. lower the XED value of the product with respect to its substitutes) so that they do not have to react to price cuts of rival firms. This can be done through product differentiation (i.e. add distinguishable features to product); or advertising to promote perceived uniqueness.

- Examples of product differentiation: Improving after-sales service, longer operating hours, faster deliveries, loyalty points/stamp cards for regular customers to increase brand loyalty, longer warranty, faster and/or free delivery etc.
- Examples of advertising: celebrity endorsements and YouTube advertisements.

<u>Joint promotion with complementary goods</u>
If a product has a **close complement** produced by another firm, then the producer can link his marketing strategy to the pricing policy of the other firm.

- o For example, the manager of a computer software shop can expect an increase in demand for his products when the prices of laptops fall. He should then stock up more types of computer software and perhaps display them more prominently when prices of laptops were to drop. When they demand for computer software increases, equilibrium price and quantity of the products would increase, and therefore lead to an increase in TR for the producers.
- o A firm which offers two goods that are complementary can also package them together for joint sales. Complements should also be displayed in the same area so that customers can buy both of them at the same time, e.g. marinate sauces and condiments next to the meat counter.

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                        ┌─────────────────────────┐
                        │    Applications of XED   │
                        └─────────────────────────┘
                                     │
                        ┌─────────────────────────┐
                        │        Producers         │
                        └─────────────────────────┘
                        │                          │
        ┌─────────────────────────────┐   ┌─────────────────────────┐
        │ Responding to Rival Firms'  │   │   Marketing Strategies   │
        │         Price Cuts          │   │                          │
        └─────────────────────────────┘   └─────────────────────────┘
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Responding to Rival Firms' Price Cuts	Marketing Strategies
If XED of firm's product with respect to price of related good is positive and |XED| > 1 (i.e. strong substitute): - Rivals raise price: don't follow, keep price the same - Rivals lower price: follow, lower price to same level as rivals' If XED of firm's product with respect to price of related good is positive and |XED| < 1 (i.e. weak substitute): - No need to follow rival firms' price cuts	If XED of firm's product with respect to price of related good is positive and |XED|>1 (i.e. strong substitute): - Advertise/engage in product differentiation to reduce |XED| magnitude If XED of firm's product with respect to price of related good is negative and |XED|>1 (i.e. strong complement): - Bundling to increase convenience - Adjust stocks based on price changes of complement goods

10 Price Elasticity of Supply

10.1 Definition and Formula

Definition: The price elasticity of supply (PES) measures the degree of responsiveness of quantity supplied of a commodity to a change in its price, ceteris paribus.

*Note: The change in price is the **cause**, while the change in quantity supplied is its **effect**.*

Students should use 'quantity supplied' in the definition of PES – and not 'supply' because PES measures the responsiveness of quantity supplied to a change in price of the good.

FORMULA:

$$PES = \frac{\text{Percentage change in quantity supplied}}{\text{Percentage change in price}}$$

$$= \frac{\dfrac{\Delta Qs}{Qs} \times 100\%}{\dfrac{\Delta P}{P} \times 100\%} \quad = \frac{\Delta Qs}{\Delta P} \times \frac{P}{Qs}$$

Where   Qs = initial quantity supplied,
ΔQs = change in quantity supplied,
P = initial price,
ΔP = change in price

Based on the Law of Supply, price and quantity supplied are directly related, hence <u>the sign of PES is always **positive**</u>.
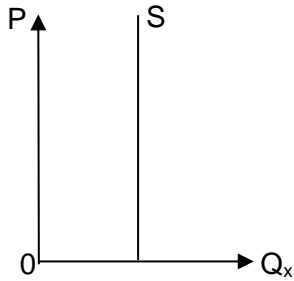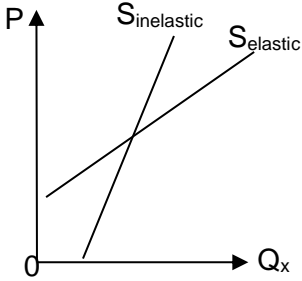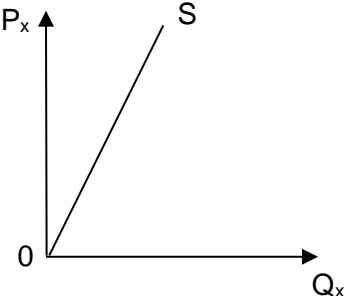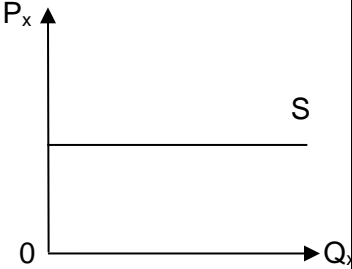
EXAMPLE:
If a 10% increase in the price of petrol leads to a 5% increase in the quantity supplied, then the price elasticity of supply of petrol is :

$$PES = \frac{5\%}{10\%} = 0.5$$

This shows that the quantity of petrol supplied is only slightly responsive to a change in its price. A rise in price of petrol will lead to a *less than proportionate* rise in quantity supplied.

The value of PES shows the sensitivity of producers to price changes of the product itself. The larger the PES, the greater the sensitivity of quantity supplied to a price change and the more price elastic is the supply.

10.2 Degrees of Price Elasticity of Supply

PES Value	Interpretation	Diagram
PES = 0	Supply is perfectly price-inelastic – *A change in price will not change quantity supplied, ceteris paribus.* Quantity supplied stays constant regardless of the price of good, e.g. original paintings.	
PES < 1	Supply is price inelastic – A given change in the price of a good will lead to a ***less than proportionate change*** in quantity supplied, ceteris paribus. ***The supply curve cuts the X-axis.***	
PES > 1	Supply is price elastic – A given change in the price of a good will lead to a ***more than proportionate*** change in quantity supplied. ***The supply curve cuts the Y-axis.***	
PES = 1	Supply is unitary price elastic – A given change in the price of the good will bring about a *proportional* (equivalent) change in quantity supplied, ceteris paribus. All straight line supply curves from the origin are unitary price elastic.	
PES = ∞	Supply is perfectly price elastic – Producers are willing to produce any quantity at the prevailing price. Any change price will cause quantity supplied to fall infinitely to zero.	

Note: In this syllabus, we tend to focus on the cases where supply is price elastic (PES>1) and price inelastic (PES<1) as the others are seldom observed in reality.

Students should specify whether the PES of a good is 'more/ less than one' – rather than 'high/low' – to show whether a given change in price would lead to a more/ less than proportionate change in quantity supplied.

10.3 Determinants of Price Elasticity of Supply

a) Availability of Spare Capacity

The availability of spare capacity is one important determinant of the price elasticity of supply.

Supply is likely to be price elastic if firms have plenty of spare capacity such as excess labour and raw materials. As such, with a change in price, producers can readily increase or decrease production quickly. As such, quantity supplied can change more than proportionately in response to the price change and supply will be more price elastic.

If all these conditions hold, additional output can be produced at low costs (i.e. marginal cost will be low) and supply will be relatively price elastic.

Supply is likely to be price inelastic if firms have limited spare capacity (e.g. no more available labour to be activated). If resources are not readily available, the producers will find it difficult to change their quantity supplied in response to a price change. For example, if raw materials are not available, a producer will not be able to readily increase production. As such, quantity supplied will change less than proportionately in response to the price change and supply will be price inelastic.

b) Cost & duration of storage

The cost and length of storage is another important determinant of price elasticity of supply.

Supply is likely to be price <u>elastic</u> if:

> Firms can easily **store goods at low cost and these goods are non-perishable or have long shelf-lives**. This is so that a sudden increase in price due to increase in demand can be met by drawing from stocks and any sudden fall in demand and price can be met by storing up goods;

Supply is likely to be price <u>inelastic</u> if:

> Goods are **perishable** and have **short shelf-lives**. Therefore, firms cannot stock up to prepare for unforeseen increases in demand and price. It is also difficult for firms to reduce quantity supplied when price falls as they cannot channel these goods to storage.

c) Time period / Length & Complexity of Production Process

i. Short run (SR):

In the short run, firms are unlikely to be able to significantly increase quantity supplied immediately. Supply is virtually fixed or can only vary according to available stocks. Supply may be highly price inelastic. A vertical supply curve represents the completely price inelastic nature of supply in the very short run. This may be especially true in the case of agricultural products that may have a long gestation period of a few months.

Products with very complex production process, e.g. commercial airplanes, would also tend to have price inelastic supply as it is difficult to adjust the production process in the short run.

ii. Long run (LR):
In the long run, there will be sufficient time for all inputs to be varied as firms can enter or leave the industry. Long run supply, therefore, is expected to be relatively more price elastic than short run supply.

d) Factor Mobility / Availability & Substitutability of Factors of Inputs

Factor mobility refers to the ease at which variable factors of production can move from one industry to the other. The greater the ease with which factors can be moved into or out of an industry, the greater the price elasticity of supply of the product of the industry.

For instance, a rise in the price of corn due to an increase in demand, may raise the producer's profits. If he can easily attract land, labour and capital from other uses (i.e. factors are mobile), then he will be able to expand the quantity supplied of corn in response to the higher corn prices. However, some goods, e.g. pharmaceutical goods and airplanes, require highly-skilled labour that may be difficult to divert from the production of other goods. Therefore, producers may find it difficult to increase production in such cases despite an increase in price, which makes supply price inelastic.

Summary Table for Determinants of Price Elasticity of Supply (S.O.R.T.)	
S	Cost and period of **Storage**
O	Spare Capacity **Obtainable**
R	Mobility, Availability & Substitutability of **Resources** (Factors of production/ inputs)
T	**Time** Period & Complexity of production

10.4 Importance of PES

One of the most important uses of PES is to determine the **extent of price and quantity fluctuations given a change in <u>demand</u>.**

In explaining the use of PES here, we need to explain possible **demand** factor leading to effect on equilibrium price and quantity first.

The more price inelastic the supply, the greater the price fluctuations (and the lower the quantity fluctuations) would be if the <u>demand</u> for the good changes.

**The extent of change in equilibrium price and quantity due to changes in demand when PES>1 and PES<1**

Change in Demand	PES	Change in Pe	Change in Qe	Scenarios
↑ Demand	PES>1	Limited ↑ Pe	Sharp ↑ Qe	Scenario 1 [Figure 30a]
	PES<1	Sharp ↑ Pe	Limited ↑ Qe	Scenario 2 [Figure 30a]
↓ Demand	PES>1	Limited ↓ Pe	Sharp ↓ Qe	Scenario 3 [Figure 30b]
	PES<1	Sharp ↓ Pe	Limited ↓ Qe	Scenario 4 [Figure 30b]

*Note: PES does not affect the **directional change** in Pe and Qe when demand changes, e.g. when demand increases, Pe and Qe will increase regardless of PES, ceteris paribus.*

*PES affects the **extent** to which Pe and Qe changes when they are brought about by changes in demand.*
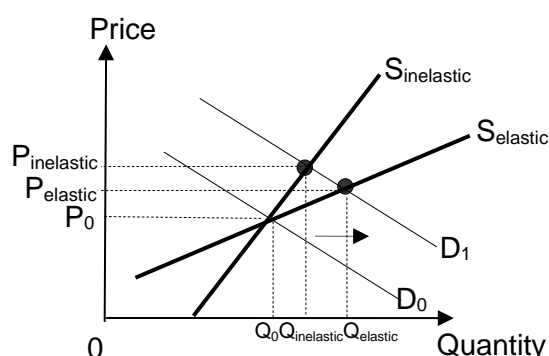
Figure 30a: Increase in Demand with PES>1 & PES<1 [Scenarios 1 & 2]
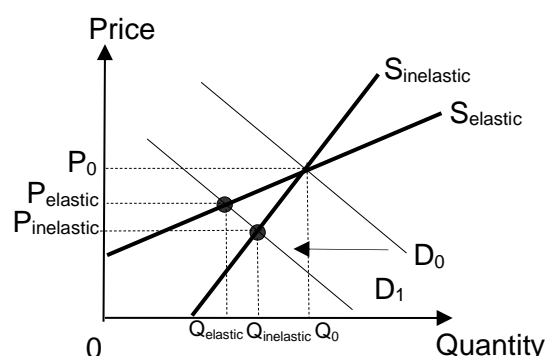
Figure 30b: Decrease in Demand with PES>1 & PES<1 [Scenarios 3 & 4]

In Figure 30a, **demand has increased** from D_0 to D_1. This may be caused by changes in non-price determinants of demand like an increase in consumers' income or changes in consumers' tastes and preferences.
- When supply is price **elastic** at $S_{elastic}$, there will be a limited increase in equilibrium price from P_0 to $P_{elastic}$, and a significant increase in equilibrium quantity from Q_0 to $Q_{elastic}$.
- However, the same increase in demand from D_0 to D_1 with a supply that is price **inelastic** at $S_{inelastic}$ will see equilibrium price increase significantly from P_0 to $P_{inelastic}$. There will be a limited increase in equilibrium quantity from Q_0 to $Q_{inelastic}$.

In Figure 30b, there is a **decrease in demand** from D_0 to D_1.
- When supply is price **elastic** at $S_{elastic}$, there will be a limited decrease in equilibrium price from P_0 to $P_{elastic}$, and a significant decrease in equilibrium quantity from Q_0 to $Q_{elastic}$.
- However, the same decrease in demand from D_0 to D_1 with a supply that is price **inelastic** at $S_{inelastic}$ will see equilibrium price decrease significantly from P_0 to $P_{inelastic}$. There will be a limited decrease in equilibrium quantity from Q_0 to $Q_{inelastic}$.

*Note: Students tend to be confused about when to use PED and PES to analyse the extent to which Pe and Qe change. As a rule of thumb, **PES** should be used to analyse the extent to which __changes in demand__ change Pe and Qe.*

Diagrammatically, gradient of the supply curve along which the demand curve shifts – represented by PES, informs us of the extent of the resultant change in Pe and Qe.

Try the following Self-Assessment to understand why.

Self-Assessment 9

Draw a diagram similar to 30a and 30b, comparing the effects (price and quantity) of a given increase in supply on (i) a price elastic demand; and (ii) price inelastic demand curve.

10.5 Application of PES

In general, we can use price elasticities of supply to predict the extent of price changes. Predicting the extent of price changes could be of particular concern to governments who may need to consider policies to moderate the price changes in order to maintain price stability.

The resulting fluctuations in equilibrium price will be:
- **Smaller**; if producers are very responsive to price changes (demand and supply being price elastic).
- **Larger**; if producers are not very responsive (i.e. demand and/or supply being price inelastic).

An example of large fluctuation in prices due to price inelastic supply is in the **agriculture market.** The prices of agricultural products tend to *fluctuate* **widely** from year to year.

The reasons for large price fluctuations in the agriculture market are:

- The supply of agricultural products also tends to be **price inelastic** in the short run as once farmers have planted and cultivated their crops, they can supply no more and no less – unless they decide to store or destroy the crops. Crops also have a longer production period.

- In recent years, demand for agricultural products has been increasing due to rising income and population.

Combining these two factors, prices of these products tend to fluctuate significantly. Figure 31 below shows that for the same increase in demand, the price fall for an agricultural product is *greater* than that of a product with demand that is more price elastic, e.g. manufactured goods.
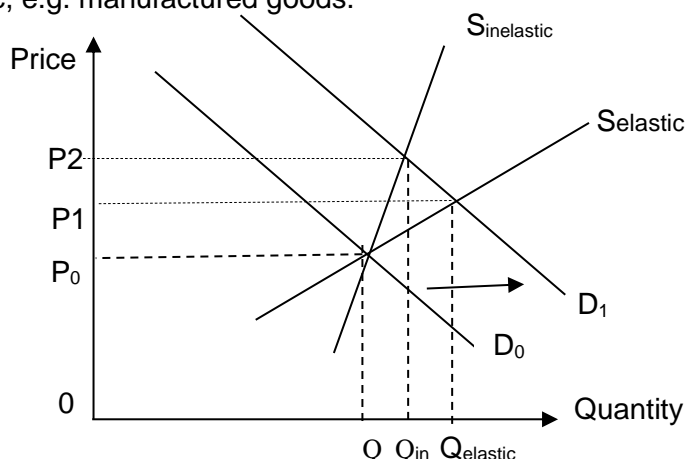
Figure 31: Increase in Price due to increase in demand in agricultural market

With an increase in demand from D_0 to D_1, we can observe a larger rise in price from P_0 to P_2 in the case of agricultural goods where supply tends to be price inelastic.

In the case of manufactured goods where supply tends to be relatively more price elastic, the price would have increase to a smaller extent, from P_0 to P_1.

Thus, due to the price inelastic supply of agricultural products, when demand for agricultural products changes, prices tend to change more as compared to when supply is price inelastic.

Self-Assessment 10:
Imagine a situation where a manufactured good and an agricultural good both experienced the same decrease in demand.

Use a diagram to illustrate how the resultant decrease in price of the agricultural good will be greater than price decrease of the manufactured good because the agricultural good has a price inelastic supply while the manufactured good has a price elastic supply.

In summary, the prices of agricultural products tend to be unstable and fluctuate greatly due price inelastic supply with frequent fluctuations of demand.

Hence, governments concerned with these wide fluctuations might implement policies to stabilise prices, e.g. price ceilings.

Stinking rich? Rare durian fruit go on sale for $1,000 each

A rare durian fruit is causing a stir in <u>Indonesia</u>, where the pungent delicacy is selling for the equivalent of USD$1,000 each, or more than three times the average monthly wage.

The brains behind the "J Queen" variety is a 32-year-old Indonesian psychology major called Aka, who claims he created a new and rare version of durian by crossbreeding two superior varieties from different regions in Indonesia.

The "J-Queen" tree, he says, bears fruit only once every three years and reportedly has a "peanut and butter taste". Rather than typically oblong in shape, fruit from the J-Queen durian is round and yellow gold.

According to reports in the Indonesian media, two "J-Queen" durians have been sold since they were put out on display in a shopping centre in Tasikmalaya, West Java at the weekend.

Question: Using demand and supply analysis, how would you explain why J-Queen durians are able to command such high prices?

Diagram Drawing Edition: Price Fluctuations

Watch how these diagrams are drawn, step-by-step, and learn when to use this diagram in your exams!

11 Government Intervention & Analysis on Government Policies using Elasticity Concepts

11.1 Introduction to Government Intervention

Government intervention is any action carried out by the government that affects the market with the objective of changing the free market equilibrium/outcome. The government intervenes in many markets, especially when there are unfavourable outcomes that need to be corrected.
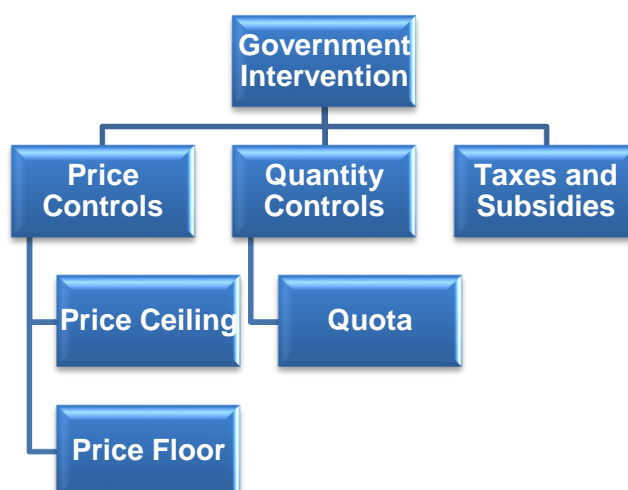
11.2 Rationale for Government Intervention

There could be various reasons for government intervention in markets. Governments may wish to:
- encourage, discourage or even prohibit the production or consumption of a good to maximise social welfare;
- raise tax revenue for government and/or producers revenue;
- make certain goods more affordable; or
- redistribute incomes to reduce income inequality.

11.3 Types of Government Policies

The government can use a variety of tools when it intervenes in the market. The choice of the intervention method will depend on the objective of the intervention, If the government aims to influence equilibrium price, it will use price controls and if it wishes to influence equilibrium quantity, it will engage in quantity controls. The figure below provides a summary of the various intervention methods that you need to know in your syllabus.

Methods of Government Intervention

Evaluation of Government Policies - FEAST Framework

In our study of government intervention, we will also need to be cognizant of the strengths and limitations each policy, in addition to understanding how each policy works.

The acronym **FEAST** provides a guide for you to identify the areas of strength and weaknesses of the respective policies.

FEAST stands for **F**easibility, **E**ffectiveness, **A**ppropriateness, **S**ide-Effects and **T**ime. The detailed description can be found in the table below:

Criteria of Evaluation	Definitions / Descriptions
Feasibility	**Refers to the extent which the policy can be carried out by the government** • Manpower and financial resources need by government to implement and monitor (to ensure compliance)
Effectiveness	**Refers to the extent to which the policy, if implemented, can solve the problems or can achieve the stated goal/meet the objectives of the policy-maker** • How much fall in quantity demanded for cigarettes due to tax
Addressing Root Cause	**Refers to whether the policy is tackling the <u>root cause</u> of the problem or simply targeting the symptoms** • Have to identify the root cause/s first
Side Effects	**Refers to any unintended consequence (positive and negative) the policy might have on other objectives of the firm or govt adopting the policy or measure in others, the conflict of goals** • Positive & negative side effects on: government revenue.
Time Lag	**Refers to how long it takes for the policy to take effect** • Need to consider short-run vs long-run effects of policies

The FEAST framework can also be applied when assessing which policy / policies are the best in addressing the problem.

In summary, it is important to understand **3As** when you study government policies:

1. **Aims:** Objective/s of Government Intervention

2. **Analysis:** Economic Analysis on how the policy meets the objective (Mechanism of policies)

3. **Assess:** Strengths and Limitations of the Policy [FEAST Framework]
This will be how the succeeding sub-sections will be structured to facilitate your learning.

11.3.1 Price Controls

When the government imposes price controls, they are artificially setting a price different from the market clearing price (i.e. the equilibrium price). These controls can take the form of stipulating a maximum price (<u>price ceiling</u>) or a minimum price (<u>price floor</u>).

11.3.1.1   Rationale for Price Control

When the government imposes price controls, it usually aims to reduce large fluctuations in prices and prevent extreme prices for certain essential goods, such as water and agricultural products, in the interest of consumers and producers.

The detailed rationale for each policy is discussed in this section below.

11.3.1.2   What is a Price Floor and what are its aims? (Aims)

> **Definition:**
> An effective price floor is a legally established minimum price **<u>above</u>** the market equilibrium price.

The government may set a price floor in the interest of producers, so that prices are kept high to generate higher income or revenue for producers.

For example, in countries where the agricultural sector is of strategic value, governments may regulate the prices of agricultural goods in an attempt to ensure that farmers (producers) earn a <u>higher and more stable income</u> than they would otherwise earn at market prices. Such price floors for agricultural products are in place in some European countries.

11.3.1.3   How does a Price Floor work? (Analysis)

Countries, such as Australia and Japan, have minimum wage laws in countries to ensure a <u>minimum income</u> for workers in the labour market (especially unskilled workers).

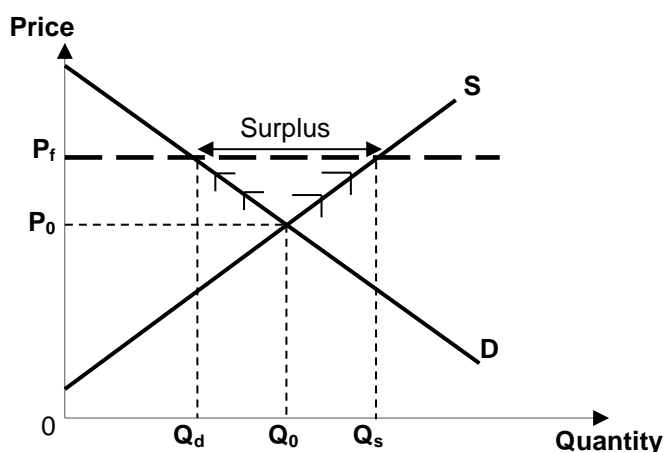<u>Diagrammatic Analysis of Price Floor</u>

Figure 32: Imposition of an Effective Price Floor

In Figure 32, a price floor of P_f is imposed. The imposition of the price floor P_f will result in an increase in quantity supplied (from Q_0 to Q_s) and a decrease in quantity demanded (from Q_o to Q_d).

At price P_f, quantity supplied (Q_s) exceeds quantity demanded (Q_d), and a surplus arises (Q_d Q_s).

In a free market economy, price will fall when there is a surplus. However, with the price floor in place, sellers cannot sell below this price (P_f). Hence the surplus cannot be eliminated and only Q_d is traded in the market.

11.3.1.4 Evaluation of Price Floor with the FEAST Framework (Assess)

1. Feasibility

If the government has to buy up the surplus in the market (e.g. excess crops that farmers cannot sell), there may be significant implementation cost as government needs to set aside funds to buy up the surplus as well as look into storage of the surpluses bought.

2. Effectiveness and Addressing Root Cause (*Impact on Producers' TR*)

The price floor may be effective if penalties are sufficiently heavy, the various economic agents will comply with this legally established minimum price.

Where the government buys up the surplus, the policy will be effective in increasing the income (total revenue) of the producers from $0P_0$ x $0Q_0$ to $0P_f$ x $0Q_s$ in Figure 32 above.

However, where government does not buy up the surplus, **whether the Price Floor is effective in increasing producers' income depends on the Price Elasticity of Demand**.

If $0 < |PED| < 1$, the increase in price will lead to a less than proportionate fall in quantity demanded and this leads to an increase in Total Revenue.

Conversely, if $|PED| > 1$, then the rise in price will lead to a more than proportionate fall in quantity demanded, this leads to a fall in TR.

Diagrammatic Drawing Exercise	
When $0 < |PED| < 1$	**When $|PED| > 1$**
Figure 33a	Figure 33b

It may thus be effective in raising producers' revenue when $0 < |PED| < 1$ and inappropriate when $|PED| > 1$.

> **Note:**
> When analysing the impact of a price floor on consumers' **total expenditure**, we will also need to use the same PED analysis as above.
> - If PED>1 : Rise in price → more than proportionate fall in qty demanded → TE falls
> - If PED<1 : Rise in price → less than proportionate fall in qty demanded → TE rises

3. Side Effects

a. Deadweight Loss

The price floor may result in a welfare loss for society. Without price control, at P_0 and Q_0, the economic welfare is represented by Area ABC in Figure 34, which is the sum of consumer surplus (Area D+E+F) and producer surplus (Area G+H).
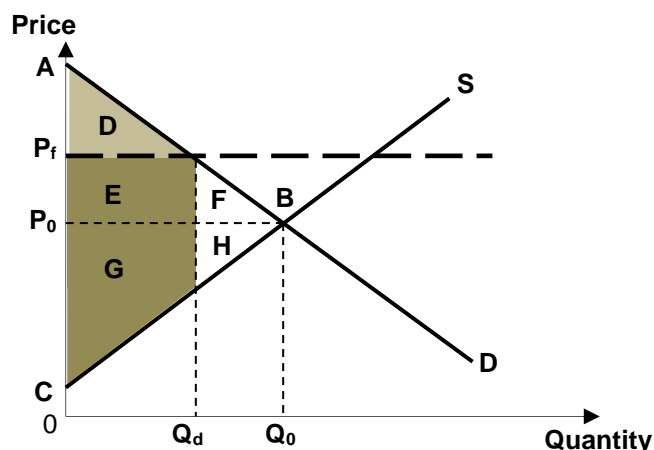

Figure 34: Welfare Analysis of an Effective Price Floor

As a result of the price floor, P_f, the new consumer surplus is represented by Area D. There is a <u>loss in consumer surplus</u> of Area E+F as a result of the price floor. On the other hand, the new producer surplus is represented by shaded Area E+G. There is a loss of producer surplus of area H but also a transfer of surplus from the consumers to the producers of Area E.

Under a price floor, economic welfare is represented by area D+E+G. As a result of the price floor, a welfare loss is created. The **welfare loss is represented by Area F+H** (reduction in consumer surplus and consumer surplus after the price floor is imposed).

b. Surplus

The Price Floor also results in a surplus and wastage. If not bought up by the government, it may result in losses incurred by the producers and cause a fall in their incomes. The size of the surplus may differ according to different elasticity values. When Demand and Supply are more price elastic, the size of the surplus may be greater and thus, producers may incur higher losses.

Diagrammatic Drawing Exercise	
When 0 <|PED| <1 and 0<PES<1	When |PED|>1 and PES>1
Surplus may be less severe	Surplus may be more severe
Figure 35a	Figure 35b

c. Government Burden

In the case of agricultural goods, the government may step in to resolve the problem by buying up the surplus of Q_dQ_s, e.g. Thai government's rice support scheme, or exporting these goods to non-agriculture producing countries. In the case of surplus labour, there may be a consequence of persistent unemployment or greater government expenditure to provide unemployment benefits for this group of people.

4. Time lags

There may be very short impact lags. This is because the government can effect the laws via its legal framework rather quickly. Thus, the price floor may be implemented rather immediately.

> **Decision Making Framework:**
>
> The welfare loss, persistent unemployment, possible greater government expenditure are part of the *unintended* consequences of the decision to intervene.

11.3.1.5 What is a Price Ceiling and what are its aims? (Aims)

> **Definition:**
> An effective price ceiling is a legally established maximum price **below** the market equilibrium price.

The government may implement price ceilings for the following reasons:
- To keep the price of a good at a level affordable to the majority, in order to protect consumers' interest, e.g. the government may be concerned if prices of necessities such as healthcare services and rents are too high.
- To prevent exploitation by producers who may charge high prices in times of shortages, e.g. Rice during war times, or surgical masks during a virus outbreak.
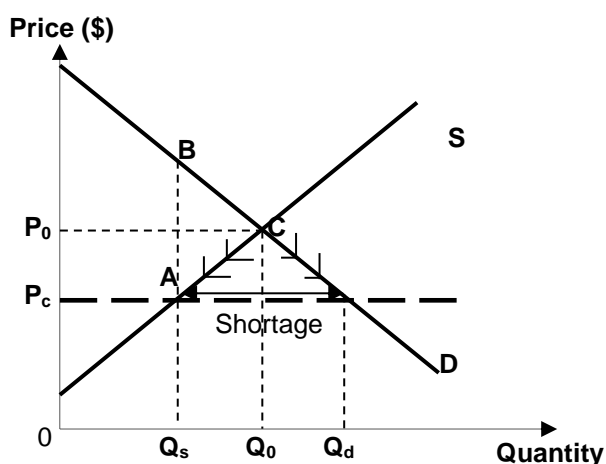
11.3.1.6 How does a price ceiling work? (Analysis)

Figure 36: Imposition of an Effective Price Ceiling

Diagrammatic Analysis of Price Ceiling

In Figure 36, a price ceiling P_c is imposed.

The imposition of a price ceiling at P_c will result in a decrease in quantity supplied (from Q_0 to Q_s) and an increase in quantity demanded (from Q_0 to Q_d).
At price P_c, quantity demand (Q_d) exceeds quantity supply (Q_s), creating a shortage (Q_sQ_d).

In a free market economy, price should increase when there is a shortage. However, with the price ceiling in place,

sellers cannot sell above this price (P_c). Hence the shortage cannot be eliminated and only Q_s is traded in the market.

11.3.1.7 Evaluation of Price Ceiling with FEAST Framework (Assess)

1. Feasibility

A price ceiling is also feasible as it requires low implementation cost. If penalties are sufficiently heavy, the various economic agents will comply with this legally established maximum price and it may not require exorbitant monitoring costs. Thus, it is feasible to implement price ceiling when necessary.

2. Effectiveness

Using price ceiling will be effective to achieve the intended outcome of lowering the price of rental housing if the market is well regulated by the government to prevent actions by landlords whom might put their accommodation to other uses.

3. Addressing Root Cause

It does not address the root cause of the problem if income is falling due to recession. It simply targets the symptoms of the problem. If price of rental housing is rising due to speculations in the property market, this resolves the issue of high rental price.

5. Side Effects

    a. Deadweight Loss

Without price control, at P_0 and Q_0, the economic welfare is represented by Area ABC in Figure 37, which is the sum of consumer surplus (Area D+E) and producer surplus (Area F+G+H).
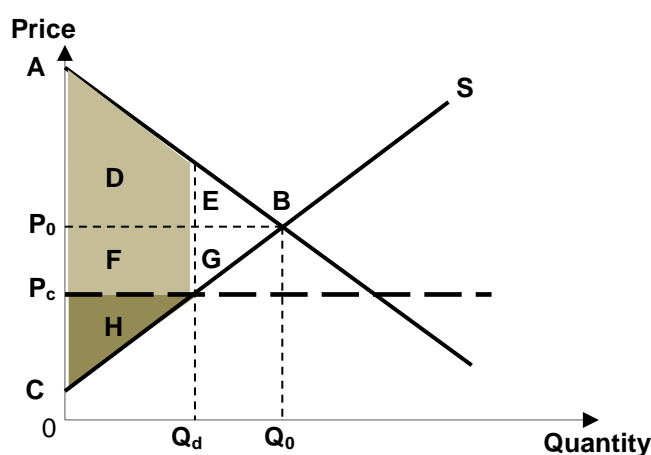

Figure 37: Welfare Analysis of an Effective Price Ceiling

As a result of the price ceiling, P_c, the new producer surplus is represented by Area H. There is a <u>loss of producer surplus</u> of Area F+G.

On the other hand, the new consumer surplus is represented by shaded Area D+F. There is a loss in consumer surplus of area E but also a transfer of surplus from the producers to the consumers of Area F.

Under a price ceiling, economic welfare is represented by area D+F+H. As a result of the price ceiling, a welfare loss is created. The **welfare loss is represented by Area E+G** (reduction in consumer surplus and consumer surplus after the price ceiling is imposed.

b. Shortage and Black Market

The Price Ceiling also results in a shortage. The size of the shortage may differ according to different elasticity values. When Demand and Supply are more price elastic, the size of the shortage may be greater and thus issue of shortage is more severe.

Diagrammatic Drawing Exercise	
When 0 <|PED| <1 and 0<PES<1	**When |PED|>1 and PES>1**
Shortage issue may be less severe	Shortage issue is severe
Figure 38a	Figure 38b

When government sets a price ceiling, a black market is likely to result because of the shortage. A black market is one where sellers ignore the government's price restrictions and sells the good at illegally high prices.
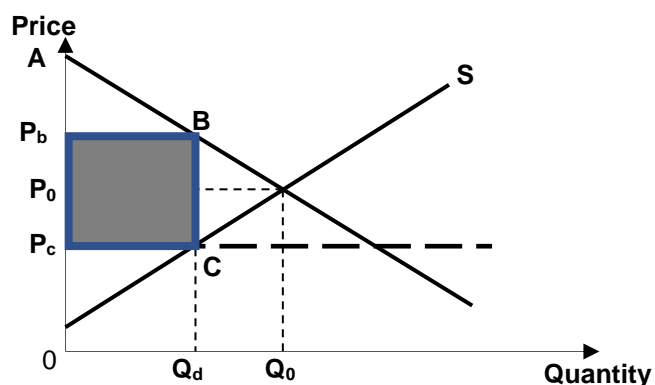

Figure 39: Black Market

In Figure 39, at Qd, the maximum price the consumers are willing to pay is Pb. This suggests that there are consumers prepared to pay beyond Pc, which is the legally established maximum price. The producers, being aware of this, will then charge Pb instead of Pc. As such, there is a loss in consumer surplus. Initially, the consumer surplus is ABCPc, but if the good is sold at Pb, the final consumer surplus is at ABPb, there is loss of consumer surplus equivalent to the shaded area. The black marketeers will gain extra revenue equivalent to the shaded area above.

d. Quality of goods/services

In some cases, quality of products or service may deteriorate after a price ceiling is imposed. For example, in the case of rent control, there is no incentive for the landlord to upgrade the amenities of the property as he is unable to recover the cost from his tenants. This results in the property being left in a derelict state.

e. Impact on producers' TR and consumers' TE

Total expenditure (TE) of consumer will definitely fall as the quantity purchased by consumers fall.

But shortage may mean some consumers suffer from inequitable access and need to obtain the product through the black market. Only high-income households can afford the goods sold in the black market.

Total revenue (TR) of the producer will definitely fall as both quantity exchanged and price falls.

5. Time Lags

Similar to price floor. There may be very short impact lags. This is because the government can effect the laws via its legal framework rather quickly. Thus, the price ceiling may be implemented rather immediately.

Diagram Drawing Edition: Welfare Analysis of Price Controls using CS and PS

Watch how these diagrams are drawn, step-by-step, and learn when to use these diagrams in your exams!

Self-Assessment 11:

With an aid of a diagram, illustrate what will happen if:
(i) the price floor is set below the market equilibrium price?

Figure 40

(ii) the price ceiling is set above the market equilibrium price?

Figure 41

11.3.2 Quantity Controls- Output Quota

Why Quantity Controls? (Aims)

As we have covered price control in the previous part, now we will be looking at the use of quantity controls in terms of an output quota.

The government usually imposes an output quota to limit the number of goods and services available for sale, usually in terms of restrictions to imports (to protect domestic producers) or exports (to ensure self-sufficiency). Some real-world examples are the trade tensions between US and China with the US government setting quotas on imported solar panels from China.

11.3.2.1 How does an output quota work? (Analysis)

Output quotas are legally established maximum quantities defined by the government. It may be carried out by the government issuing a fixed number of licenses to producers who will then have the right to sell the goods.
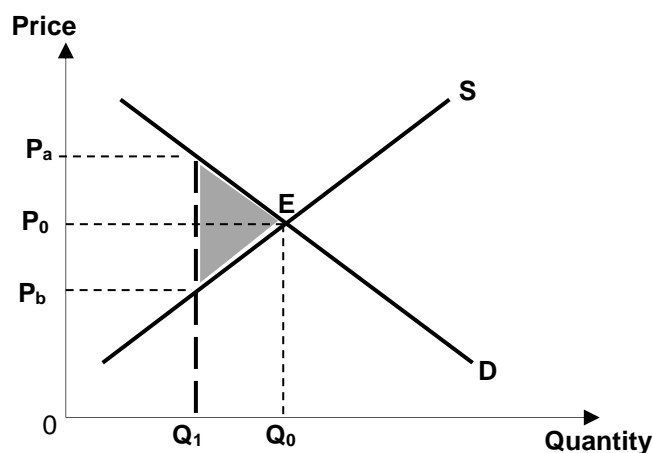
Figure 42: Imposition of an Effective Quantity Control

In the absence of government intervention, free market equilibrium is at E with equilibrium price P_o and quantity Q_0, as shown in Figure 42 above.

The equilibrium quantity Q_0 may be deemed to be higher than desirable. Hence, the government may decide to impose a quantity control at Q_1 which is lower than the free market equilibrium of Q_0.

At the quantity of Q_1, consumers are willing and able to pay a higher price of P_a to obtain the good while producers are willing to produce at the price of P_b. To maximise profit, the price charged by a producer would be at P_a.

11.3.2.2 Evaluation of Output Quota with FEAST Framework (Assess)

1. Feasibility

An output quota is also feasible as it requires low implementation cost. If penalties are sufficiently heavy, the various economic agents will comply with this legally established output limit and it may not require exorbitant monitoring costs. Thus, it is feasible to implement output quota when necessary.

2. Effectiveness

The quota sets a definite limit to the quantity of goods and services produced. Given that the policy's success is not dependent on consumers' and producers' responsiveness to price changes, it will bring about its intended outcome to reduce quantity to the socially desirable level. Thus, due to the nature of the policy, its effectiveness is more certain.

3. Addressing Root Cause

The use of output quota is appropriate as it target the quantity at the source as mentioned above. We are solving the issue at its root. The quantity produced is controlled to the desired level by the government with strict enforcement.

4. Side Effects

a. Quota Rent

The vertical distance P_aP_b represents the **quota rent** i.e. the earnings which the producers obtain because they own the license to the controlled quantity. The welfare loss, represented by the shaded area in Figure 42, include the welfare loss by consumers and producers who want to consume and supply the good respectively but are unable to because of quantity.

b. Imperfect Information

The government may under or overestimate the socially desirable quantity and thus the output quota may not bring about the true socially desirable output levels.

c. Impact on producers' TR and consumers TE

The impact of quotas on producers' TR and consumers' TE depends on PED:
- If PED>1: Rise in price → more than proportionate fall in qty demanded → TE falls
- If PED<1: Rise in price → less than proportionate fall in qty demanded → TE rises

5. Time Lags

Similar to price ceiling. There may be very short impact lags. This is because the government can effect the laws via its legal framework rather quickly. Thus, output quota may be implemented rather immediately.

11.3.3 Taxes and Subsidies

The government also aims to influence consumption and production of goods and services in the market by imposing taxes or giving out subsidies.

11.3.3.1 What are indirect taxes and their aims? (Aims)

The government may intervene in markets by imposing indirect taxes on the production and consumption of goods and services. This is done to reduce consumption or production of the good or service, so as to reduce the equilibrium quantity.

Definition:
An indirect tax usually refers to a tax on expenditure but is not paid directly by the consumers to the government but indirectly via the producer of the good.

For ease of administration, governments often tax the producer of a good or service for the quantity sold. In turn, the producer factor taxes into costs of production (hence, supply falls) and pass some of the taxes to consumers in the form of higher prices.

Indirect taxes, which cause supply to fall, will lead to a fall in equilibrium quantity, ceteris paribus. Hence, these taxes are usually **implemented on goods that the government would deem undesirable** and want to discourage consumption (e.g. cigarettes).

Note: A direct tax is usually a tax on income or wealth, as oppose to indirect tax which is a tax on production or consumption.

11.3.3.2 Specific Tax (Analysis)

Definition:
A specific tax or per unit tax is a <u>fixed amount of tax per unit</u> of a good.

How it works

For example, in Singapore, a specific tax of $0.64 is imposed per litre of petrol. If 10 litres of petrol were bought, the amount of tax payable would be $6.40.

A specific tax would increase the cost of production by the amount of the tax, causing supply to fall. Diagrammatically, this would lead to a <u>parallel shift</u> in the supply curve from S_0 to S_0+tax as shown below in Figure 43.

The vertical distance between the two supply curves represents the tax per unit (Distance BC). After the specific tax is imposed, the market equilibrium moves from point A to B. The equilibrium price had increased from P_0 to P_1 and the quantity falls from Q_0 to Q_1.

At new equilibrium B,
Tax per unit = Distance BC
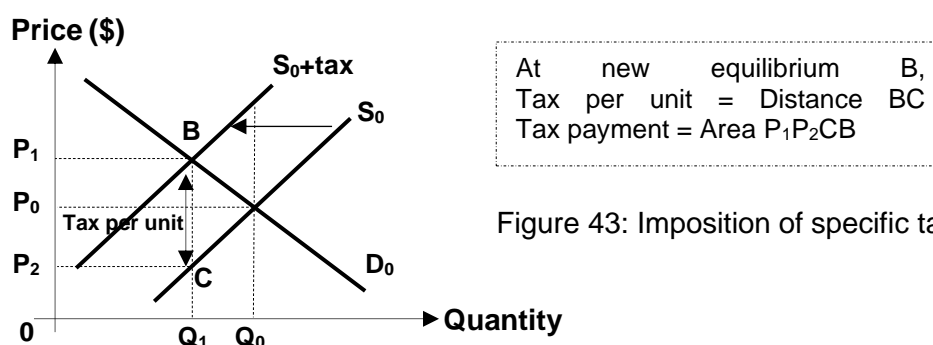Tax payment = Area P_1P_2CB

Figure 43: Imposition of specific tax

11.3.3.3 Ad Valorem Tax (Analysis)

Definition:
An ad valorem tax is calculated as a <u>percentage of the price of a commodity</u>. Hence, the higher the price of the good, the greater the tax paid to the government.

An example is the 7% Goods and Service Tax (GST). If the price of the good is $10, the tax collected is $0.70. If the price of the good is $100, the tax collected is $7.

An ad valorem tax would cause a <u>pivoted shift</u> in the supply curve from S_0 to S_0+tax, as shown below in Figure 44.

At new equilibrium B,
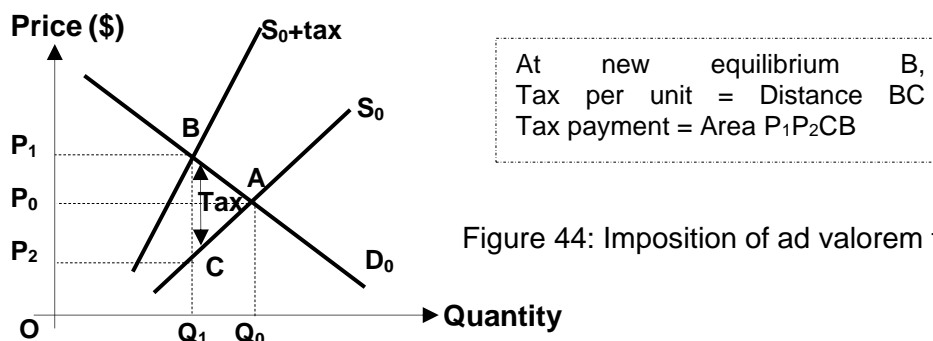Tax per unit = Distance BC
Tax payment = Area P_1P_2CB

Figure 44: Imposition of ad valorem tax

As price increases, the vertical distance (showing the amount of tax imposed per unit) increases. After the ad valorem tax is imposed, the market equilibrium moves from point A to B. The equilibrium price increased from P_0 to P_1 and the quantity falls from Q_0 to Q_1.
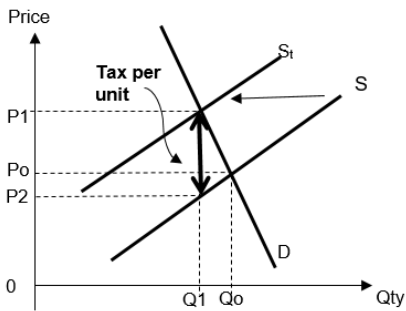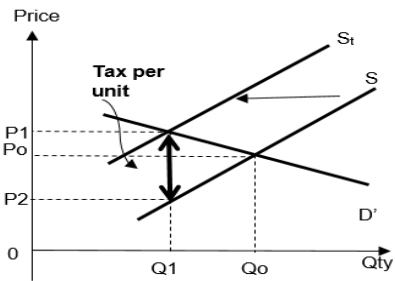
11.3.3.4 Evaluation of Indirect Taxes with FEAST Framework (Assess)

1. Feasibility
It is feasible to implement taxes on various goods. There is low implementation cost involved in tax collection. With strict law enforcement mechanisms, it is not difficult to ensure compliance and successful rolling out of this policy.

2. Effectiveness
Whether the tax is effective in reducing consumption to the desirable level depends on the Price Elasticity of Demand.

When 0 <|PED| <1 Ineffective use of Tax	When |PED|>1 Effective Use of Tax
If 0< |PED| <1, the increase in price brought by the tax will lead to a less than proportionate fall in quantity demanded and the market may not achieve the socially optimal level of consumption.	On the other hand, if |PED|>1, the increase in price will lead to a more than proportionate fall in quantity demanded and taxes will be more effective in achieving its goal of reducing quantity to the socially optimal levels.
Figure 45a showing ineffective use of Tax	Figure 45b showing effective use of Tax

3. Addressing Root Cause
Taxes may not be appropriate as it may not resolve the root cause of the problem. For example, in the case of cigarettes and alcohol, tax does not solve the root cause of the issue but only targets the reduction in quantity and not the root cause of the overconsumption, e.g. lack of information of the health risks.

4. Side Effects

a. Raises revenue for the Government

By imposing a tax, government gets to collect the tax revenue and this can be put into good use by the government. As shown in Figure 46 below, with the imposition of tax, government can collect tax revenue shown by area P_1P_2CB.

At new equilibrium B,
Tax per unit = Distance BC
Tax payment = Area P_1P_2CB

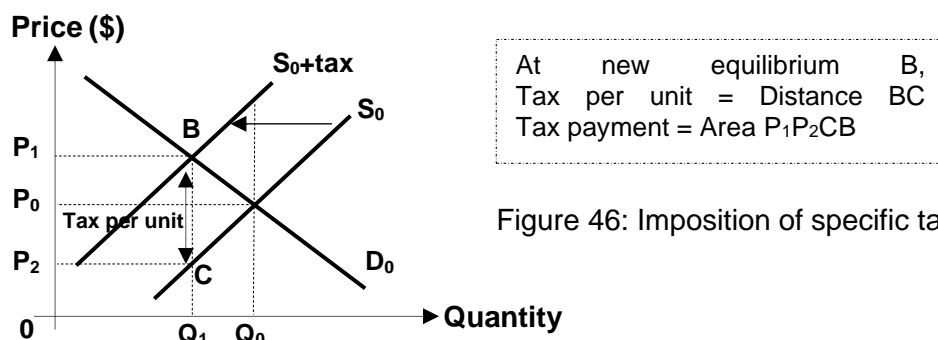Figure 46: Imposition of specific tax

b. Raise cost of production for Producers

Taxes will increase the cost of production for producers and they will reduce production from Q_0 to Q_1. With the cut in production, producers will need less manpower and some workers might be retrenched. This might cause an increase in unemployment rate if many sectors in the economy are affected by this tax.

c. Fall in Revenue for Producers

The imposition of a tax will cause a fall in Total Revenue (TR), ***regardless of the PED value***. This is because the producers will have to pay a share of the tax to the government.

When 0 <|PED| <1	When |PED|>1
Fall in total revenue	Similar fall in total revenue
Figure 47a showing fall in total revenue	Figure 47b showing fall in total revenue

From Figure 47a, we can see that the initial TR is at 0PoEoQo. After the tax is imposed, the Supply Curve shifts from S to St. The price the producer receives (nett tax) is now at P2. The new Total Revenue is 0P2aQ1. As a result, we can see that the imposition of the tax reduces Total Revenue. As for Figure 47b, we can see similar effect with a fall in Total Revenue from 0PoEoQo to 0P2aQ1.

d. Changes in Consumers' Expenditure *(Note – this is different from the analysis on producers' total revenue)*

The changes in Total Expenditure depends on the Price Elasticity of Demand. As seen from Figure 47a and 47b, we can see that the initial TE is 0PoEoQo. After the tax is imposed, the Supply Curve shifts from S to S_t.
- In Figure 47a, when **demand is price inelastic**, the Total Expenditure **increases** to 0P1bQ1
- In Figure 47b, when **demand is price elastic**, the Total Expenditure **decreases** to 0P1bQ1.

Thus, the impact of taxes on Total Expenditure depends on the Price Elasticity of Demand.

5. Time Lags

There is no time lag in implementing tax as it can be implemented immediately. However, there may be an impact lag since demand may be price inelastic in the short run. This is because it may take some time for people to change their habits.

Overtime, the PED value will increase as people might have changed their consumption pattern. The fall in Quantity Demanded might be more responsive and consumption levels will then move closer to the desired level of by the government.

11.3.3.5 Uses of Taxes to generate government revenue and reduce consumption

It is important for the government to know about elasticity concepts when planning indirect tax policies to achieve its various objectives. These objectives may include:
- To raise government revenue;
- To discourage consumption of certain goods e.g. demerit goods like cigarettes; and
- To redistribute income and help certain groups of people in society.

Recall: Indirect taxes are compulsory payments levied by the government on expenditure/spending on goods and services.[1] These taxes are levied on the producers of the good or service, not consumers, and are hence reflected as a leftward shift in the supply curve.

a) On raising of revenue through taxation

Total tax revenue collected is equal to the tax per unit multiplied by the quantity traded.

Indirect taxes increase the cost of production of the producer and result in the supply curve shifting to the left. Hence, this will result in an increase in the equilibrium price and a fall in equilibrium quantity.

Goods with price inelastic demand	Goods with price elastic demand
If the government were to impose an indirect tax on a product with price inelastic demand, it is likely to raise a significant amount of tax revenue. ***This is because the tax causes an increase in price and a less than proportionate fall in quantity demanded.***	In contrast, imposing an indirect tax on a product with price elastic demand is unlikely to raise much tax revenue for the government ***as the tax causes an increase in price and a more than proportionate fall in quantity demanded.***

---

[1] They can be classified into 3 types: general expenditure taxes, excise duties and customs duties.

Therefore, if the government's aim is to raise revenue through taxation, they should tax goods with price inelastic demand.
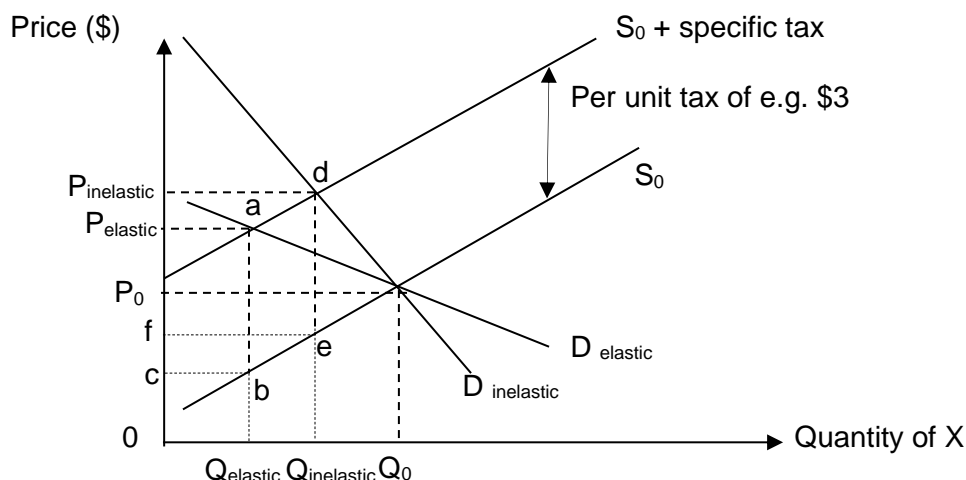
Figure 48: The effects of an indirect tax on tax revenue

With reference to Figure 48, the imposition of tax causes supply to fall from S_0 to $S_{0+specific\ tax}$.

If demand is more price elastic at $D_{elastic}$, the new amount sold would fall from Q_0 to $Q_{elastic}$ and the tax revenue collected would be area $P_{elastic}abc$ (per unit tax multiplied by $Q_{elastic}$).

Whereas if demand is more price inelastic at $D_{inelastic}$, the new amount sold would be fall from Q_0 to $Q_{inelastic}$ and the tax revenue collected would be the larger amount of $P_{inelastic}def$.

b)   On reducing consumption of a particular good

Indirect taxes lead to a fall in supply, which increases the equilibrium price and reduce the equilibrium quantity, ceteris paribus.

Goods with price inelastic demand	Goods with price elastic demand
If the government were to impose an indirect tax on a product with demand that is price inelastic, it is <u>unlikely to significantly reduce consumption</u> (equilibrium quantity) of the good. ***This is because for goods with price inelastic demand, an increase in price caused by a fall in supply leads to a less than proportionate fall in quantity demanded*** as seen in Figure 48 where equilibrium quantity fell from Q_0 to $Q_{inelastic}$ as opposed to $Q_{elastic}$.	In contrast, ***imposing an indirect tax on a product with price elastic demand will lead to an increase in price and a more than proportionate fall in quantity demanded***, as seen in Figure 48, where equilibrium quantity fell from Q_0 to $Q_{elastic}$. <u>Consumption is thus reduced more significantly</u> than when demand is more price inelastic.

Therefore, if the government's aim was to discourage consumption of a given good, taxation will work better on goods with price elastic demand.

In Summary:

If indirect taxes are imposed on goods with price inelastic demand, such as cigarettes and liquor, the reduction in quantity demanded will be proportionately less than the increase in price. In this case, tax revenue collected would be higher but the policy is less effective in discouraging the consumption of these goods. Hence, it is important for policymakers to tailor their policies with reference to the price elasticity of demand for a good in order to achieve their desired goals.

11.3.3.6 Subsidies

What is a subsidy and what are its aims? (Aims)

> **Definition:**
> A subsidy is an amount of money given to the producers for each unit they sell.

A subsidy is usually issued by the government in order to increase the consumption or production of a good of service. This increases the equilibrium quantity.

How does subsidy work? (Analysis)

Similar to indirect tax, subsidies are given to producers to encourage the production and consumption of certain goods. A subsidy reduces the cost of production that causes the supply to increase.

Subsidies, by causing supply to increase, cause equilibrium quantity to increase, ceteris paribus. Hence, subsidies are usually **implemented on goods that the government deems desirable to have higher consumption of (e.g. healthcare, education).**
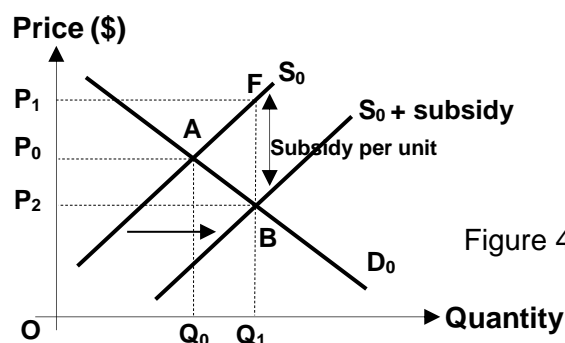
> At new equilibrium B,
> Subsidy per unit = Distance BF
> Subsidy received = Area P_1P_2BF

Figure 49: Imposition of subsidy

The imposition of a subsidy will increase the supply, shifting the supply curve from S_0 to S_0+subsidy (Figure 49). The vertical distance BF represents the subsidy per unit received. After the subsidy is provided, the market equilibrium moves from point A to B. As a result of subsidy, the equilibrium quantity increases from Q_0 to Q_1 while the price falls from P_0 to P_2.

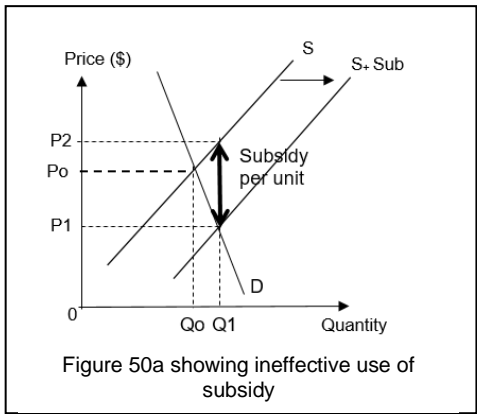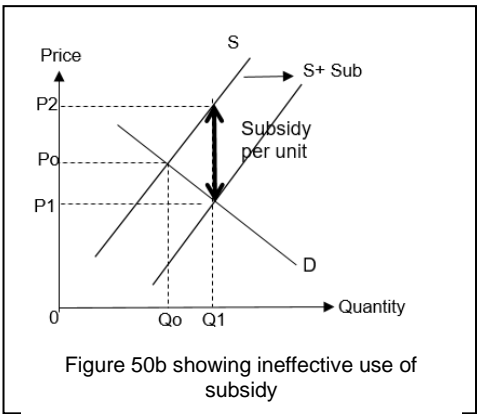**Evaluation of Subsidies with FEAST Framework (Assess)**

1. Feasibility
The feasibility of the policy depends on the state of government finances. For countries with substantial reserves like Singapore, it is feasible to use subsidies as it does not put additional strain on government reserves.

However, for countries with high levels of debt, providing subsidies may not be feasible as it may put a strain on government and incur higher debt for the government (e.g. USA, Japan, PIGS-Portugal, Ireland, Greece and Spain). This will result in serious economic repercussions.

2. Effectiveness

Whether the subsidy is effective in increasing consumption to the desirable level depends on the Price Elasticity of Demand

When $0 < |PED| < 1$ Ineffective Use of Subsidy	When $|PED| > 1$ Effective Use of Subsidy
If $0 < |PED| < 1$, the fall in price brought by the subsidy will lead to a less than proportionate rise in quantity demanded and the market may not achieve the socially optimal level of consumption.	On the other hand, if $|PED| > 1$, the fall in price will lead to a more than proportionate rise in quantity demanded and the subsidy will be more effective in achieving its goal of increasing quantity to the socially optimal levels.
Figure 50a showing ineffective use of subsidy	Figure 50b showing ineffective use of subsidy

3. Addressing Root Cause

It does not address the root cause of the problem if income is falling due to recession. With the fall in income, making good cheaper does not solve the problems arising from falling incomes and rising unemployment. It is just a temporary solution while waiting for incomes to recover.

If the price of basic necessities goes up too high, the use of subsidy can help to address the root cause of rising prices possibly due to fall in supply as a result of poor weather conditions.

4. Side Effects

a. Increase in revenue for producers

With the imposition of subsidy, the supply curve will shift to the right and this will result in a ***rise in total revenue for producers regardless of the PED value***. As shown in

the two figures shown below, with |PED|<1 and 0<|PED|<1, for both cases, there will be an increase in total revenue.

Diagrammatic Drawing Exercise	
When 0 <|PED| <1	When |PED|>1
Increase in total revenue	Similar increase in total revenue
Figure 51a showing a rise in total revenue	Figure 51b showing a rise in total revenue
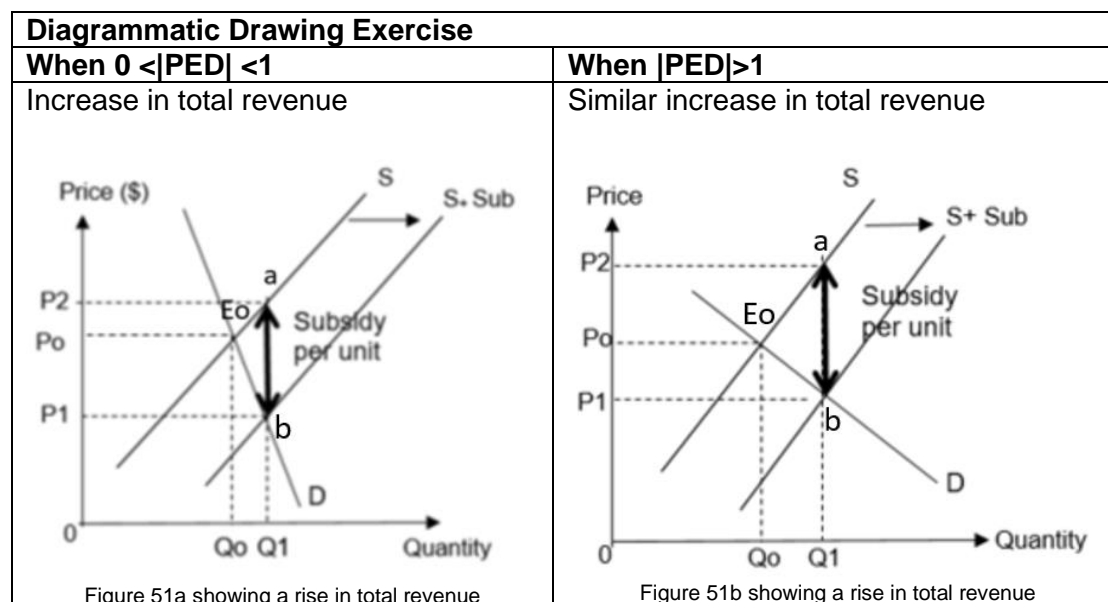
From Figure 51a, we can see that the initial TR is at 0PoEoQo. After the subsidy is imposed, the Supply Curve shifts from S to S+Sub. The price the producer receives (including the subsidy) is now at P2. The new Total Revenue is 0P2aQ1. As a result, we can see that the imposition of the subsidy increases Total Revenue. As for Figure 51b, we can see similar effect with a rise in Total Revenue from 0PoEoQo to 0P2aQ1.

b. Impact on consumers' total expenditure

The changes in Total Expenditure depends on the Price Elasticity of Demand. As seen from Figure 51a and 51b, we can see that the initial TE is 0PoEoQo. After the subsidy is imposed, the Supply Curve shifts from S to S+Sub.
- In Figure 51a, when **demand is price inelastic**, the Total Expenditure **decreases** to 0P1bQ1
- In Figure 51b, when **demand is price elastic**, the Total Expenditure **increases** to 0P1bQ1.
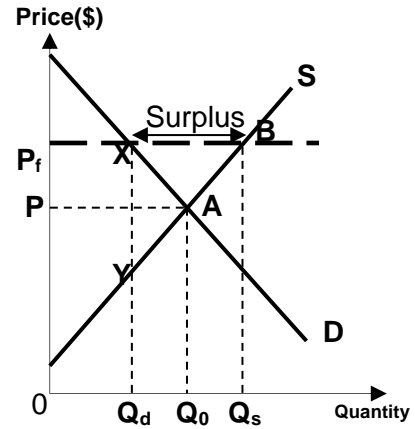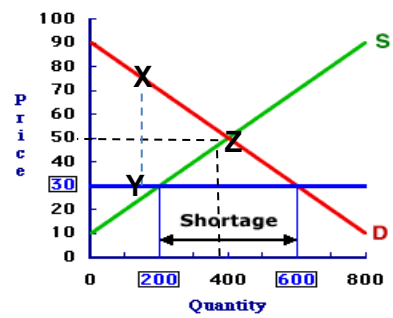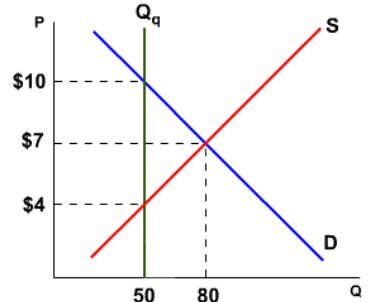
Thus, the impact of subsidy on Total Expenditure depends on the Price Elasticity of Demand.

5. Time lags

There may be some implementation lag as government spending may need to be discussed at length through parliamentary debate.

However, there may be an impact lag since demand may be price inelastic in the short run. This is because it may take some time for people to change their habits.

Overtime, the PED value will increase as people might have changed their consumption pattern. The fall in Quantity Demanded might be more responsive and consumption levels will then move closer to the desired level of by the government.

Summary of Government Interventions			
	Price Floor Price floor is a legally established minimum price that is set <u>above</u> the market eqm price. When a price floor is set at P_f, quantity demanded falls to Q_d & quantity supplied increases to $Q_s \rightarrow$ surplus of Q_dQ_s at P_f.	**Price Ceiling** Price ceiling is a legally established maximum price that is set <u>below</u> the market eqm price. When a price ceiling is set at $30, quantity demanded increases to 600 & quantity supplied falls to 200 $\rightarrow$ shortage of 200 units at $30.	**Quantity Controls** Quantity controls are a quota/ limit on the number of goods & services available for sale placed by the govt. When a quota is placed at 50 units, the price of the good/service in the market rises from $7 to $10.
	Note the instances below when PED is required and when it is not required		
Effect on Consumers' TE (P x Q)	Quantity consumed by consumers fall from Q_0 to Q_d. ***Note - Effect on TE of consumer depends on PED:*** - If PED>1 : Rise in price $\rightarrow$ more than proportionate fall in qty demanded $\rightarrow$ TE falls - If PED<1 : Rise in price $\rightarrow$ less than proportionate fall in qty demanded $\rightarrow$ TE rises	<u>**TE of consumer will definitely fall**</u> as the quantity purchased by consumers fall from 400 units to 200 units (due to shortage). TE falls from (400 units x $50 = $8000) to (200units x $30=$6000). But shortage may mean some consumers suffer from inequitable access and need to obtain pdt through the black market. Only high-income households can afford in the black market.	***Note - Effect on TE of consumer depends on PED:*** - If PED>1 : Rise in price $\rightarrow$ more than proportionate fall in qty demanded $\rightarrow$ TE falls - If PED<1 : Rise in price $\rightarrow$ less than proportionate fall in qty demanded $\rightarrow$ TE rises

Effect on Producers' TR (P x Q)	**Assuming that the surplus is bought by the government, the TR of producer will definitely increase** as TR increases from 0P0AQ0 to 0Pf BQs If govt doesn't/ is unable to buy up the surplus, producer can only sell Qd units. TR may fall depending on PED (see above explanation on TE).	**TR of the producer will definitely fall** as both quantity exchanged and price falls. Therefore, TR falls from (400 units x $50 = $8000) to (200units x $30=$6000).	*Note - Effect on TR of producer depends on PED:* - If PED>1 : Rise in price → more than proportionate fall in qty demanded → TR falls - If PED<1 : Rise in price → less than proportionate fall in qty demanded → TR rises
Effect on Government Does the government's expenditure increase? Impact on allocative inefficiency?	Government will have to buy the surplus stock at the guaranteed price which may be a strain on government resources. Assuming government revenue is unchanged, spending on subsidies will incur opportunity costs in terms of projects that are forgone, which may slow down economic growth. There is allocative inefficiency as shown in deadweight loss XYA.	Govt may incur monitoring costs to prevent unintended consequences like black markets & smuggling of the good. There is allocative inefficiency as shown in deadweight loss XYZ.	Govt may incur monitoring costs to prevent unintended consequences like smuggling of the good

	Indirect Tax An indirect tax usually refers to a tax on expenditure but is not paid directly by the consumers to the government but indirectly via the producer of the good.	**Subsidy** A subsidy is an amount of money given to the producers for each unit they sell.
Effect on Consumer - **TE (P x Q) of consumer**	Effect on TE of consumer *depends on PED*: E.g. implementation of indirect tax → ↓SS→ ↑P: - If PED>1 : Rise in price → more than proportionate fall in qty demanded → TE falls - If PED<1 : Rise in price → less than proportionate fall in qty demanded → TE rises	Effect on TE of consumer *depends on PED*: E.g. implementation of subsidy → ↑SS→ ↓P: - If PED>1 : Fall in price → more than proportionate rise in qty demanded → TE rises - If PED<1 : Fall in price → less than proportionate rise in qty demanded → TE falls
Effect on Producer - **TR (P x Q) of producer**	In the diagram above, producers' TR falls from $0P_0AQ_0$ to $0P_2CQ_1$. The imposition of a tax will cause a ***fall in producers' Total Revenue (TR) regardless of the PED value***. This is because the producers will have to pay a share of the tax to the government.	In the diagram above, producers' TR rises from $0P_0AQ_0$ to $0P_1FQ_1$. With the imposition of subsidy, the supply curve will shift to the right and this will result in a ***rise in total revenue for producers regardless of the PED value***.
Effect on Government **Does the government's** - **Expenditure increase?** - **Revenue increase?** - **Popularity of govt?**	Tax revenue for the government: P_2P_1BC. The indirect tax generates revenue for the government that can be used to provide more merit goods and public goods. The money can also be used to upgrade infrastructure, benefitting the society as a whole. However, if tax rate is too high, this may reduce popularity of the govt.	Subsidy expenditure incurred by the government: P_2P_1FB. . The subsidy may constitute a drain on government resources. Assuming government revenue is unchanged, spending on subsidies will incur opportunity costs in terms of projects that are forgone, which may slow down economic growth.

12 Limitations with the use of elasticity concepts

As seen in the previous sections, the concepts of PED, YED, XED and PES are important both in theory and application. However, there are also limitations in using these concepts:

a) Possible lack of currency and accuracy

Many of the elasticity values obtained are historical estimates of consumer behaviour and a lot may have changed over the years. There may also be cases whereby the data is only applicable to a certain group of people. Therefore, it is wrong to assume that the data provided is always accurate. That is, the PED given may be outdated, for another place/country or for another group of consumers (male/female).

For example, a PED of 0.1 for weights training equipment may only be applicable to men, as they see it as a necessity. But this figure may not be true for women, therefore any conclusion yield from this data for women will be wrong.

b) Ceteris Paribus assumption

When we calculate PED, YED, XED and PES, we assume everything else remains constant in the market other than the variables we are considering i.e. ceteris paribus assumption. However in reality, there can be many factors affecting demand, quantity demanded and quantity supplied simultaneously. These affect the accuracy of the elasticity values calculated.

For example, Firm X may cut the price of its products as its PED>1. However, TR may not increase for Firm X as rival firms may also be cutting price which causes the consumers to switch over to rival firms' products and cause demand and TR of Firm X to fall instead (i.e. ceteris paribus assumption may not hold)

These can limit the usefulness of elasticity measurements for firms and the government. Nonetheless, these concepts still provide valuable insight on the extent of changes on quantity demanded (supplied) /demand (supply).

GLOSSARY OF MAJOR KEY TERMS

Ad Valorem Tax	Tax as a percentage of the price of the good.
Competitive Supply	Goods in competitive supply are those that use similar resources for production.
Complements	Complements or goods in joint demand are goods used in conjunction with each other in satisfaction of a particular want. The cross elasticity of demand sign is positive.
Consumer Surplus	Difference between the maximum price the consumer is willing and able to pay and the price he actually paid.
Cross Elasticity of Demand (XED)	XED measures the degree of responsiveness of demand for one good to a change in the price of another good, ceteris paribus.
Demand	Demand is defined as the amount of a good or service that consumers are both willing and able to buy at each possible price in a given time period, ceteris paribus. (It is also quantity demanded at every and every price)
Derived Demand	Derived demand is the demand for a good or service that results from the demand of a related good
Elasticity	Elasticity is a measure of responsiveness of quantity demanded or supplied to a change in one of its determinants, ceteris paribus.
Income Elasticity of Demand (YED)	YED measures the degree of responsiveness of demand for a good to a change in income, ceteris paribus.
Indirect Tax	Tax on expenditure, not paid directly by the consumers to the government but indirectly via the producer of the good.
Inferior Goods	Goods whose demand varies <u>inversely</u> with consumers' income. The income elasticity of demand sign is negative.
Joint Supply	Goods in joint supply are goods that are also produced when the other is produced.
Law of Demand	The law of demand states that in a given time period, the quantity demanded is inversely related to its price, ceteris paribus.
Law of Supply	The law of supply states that in a given period of time, the quantity supplied of a product is directly related to its price, ceteris paribus.
Law of Diminishing Marginal Utility (LDMU)	The LDMU states that as more and more units of a good are consumed, the additional utility derived from each additional unit will fall.
Market	A market can be defined as an arrangement whereby buyers and sellers can negotiate in order to exchange at an agreed price.
Market Equilibrium	When quantity demanded equals to quantity supplied. Equilibrium is a state of rest where there is no tendency for any change.
Normal Goods	Goods whose demand varies <u>directly</u> with consumers' income. The income elasticity of demand sign is positive.

Price Ceiling	A legally established maximum price set below the equilibrium price.
Price Elasticity of Demand (PED)	PED measures the degree of responsiveness of quantity demanded of a good to a change in its price, ceteris paribus.
Price Elasticity of Supply (PES)	PES measures the degree of responsiveness of quantity supplied of a good to a change in its price, ceteris paribus.
Price Floor	A legally established minimum price set above the equilibrium price.
Price Mechanism	The use of price signals to allocate scarce resources among competing uses.
Producer Surplus	Difference between the minimum price the producer is willing and able to accept for a good and the price he actually receives.
Quantity Demanded	Quantity Demanded refers to a particular quantity that the consumer is willing and able to buy at a particular price, reflected by a point on the demand curve.
Quantity Supplied	Quantity Supplied refers to a particular quantity that the producer is willing and able to sell at a particular price, reflected by a point on the supply curve.
Rational Decision Making	Rationality is an assumption that economic agents aim to maximise their own welfare as they make decisions.
Shortage	When quantity demanded exceeds quantity supplied
Specific Tax	Fixed amount of tax per unit of the good.
Substitutes	Substitutes or goods in competitive demand are goods that can be used in place of one another for the satisfaction of a particular want.
Supply	Supply is defined as the amount of a good or service that the producers are both willing and able to sell at each possible price in a given period of time, ceteris paribus. (It is also quantity supplied at each and every price)
Surplus	When quantity supplied exceeds quantity demanded
Total Expenditure	Total Expenditure refers to the total amount spent by the consumers from the purchase of goods and services.
Total Revenue	Total Revenue refers to the total receipts or earnings received by producers from the sale of goods and services.
Wages	Wages are the total payments for the services rendered by labour.
Wage Rates	Wage rate is defined as the compensation for labour (mental and physical efforts of workers) per period of time (man-hours).

FOOD FOR THOUGHT – Selected Past Year A Level Essay Questions Related to This Topic:

Note: The questions below require the active use of concepts from the lecture notes of the previous topic on demand and supply.

2021(H2) Question 2

In recent years the United States (US) government has increased the tariffs (import taxes) on a wide range of imported goods from China.

(a) With the aid of a diagram, explain what is meant by consumer surplus and producer surplus. [10]

(b) Discuss the view that all economic agents in the US economy will lose from the introduction of tariffs on imported goods from China. [15]

2020(H2) Question 2

Concerns about future shortages of water resulted in Singapore's national water agency, PUB, increasing the price of water by 30% from 2017. By 2060, Singapore's total water demand could double.

(a) Explain why a shortage of water might still exist after the rise in the price of water. [10]

(b) Discuss whether the government policy of increasing the price of water is the only effective way to overcome future water shortages. [15]

2019(H2) Question 2

A firm in Singapore is facing an increase in demand for its goods which has led to an increased demand for labour. Its demand for labour is also inelastic. In addition, large numbers of its workers born in the 1960s ('baby-boomers') have been retiring, reducing the number of workers available to the firm.

(a) With the aid of a diagram, explain how this firm's total expenditure on its workforce will have changed as a result [10]

(b) Discuss whether making changes to the foreign work levy is likely to be the most effective way the Singapore government can address the labour shortages experienced by such firms. [15]

2018(H2) Question 1

The average price of concert tickets for two concerts performed by singer-songwriter Ed Sheeran in November 2017 at the Singapore indoor Stadium was $180. Tickets went on sale six months earlier and both concerts sold out almost immediately. Some tickets were later being offered for resale at prices well above their market value.

(a) Using supply and demand curves, explain why there is an excess demand for tickets and why there is a high resale price. [10]

(b) Discuss possible strategies that concert organisers could use to improve the market outcome for this type of concerts for producers and consumers. [15]

2017(H2) Question 2

Falling interest rates continued income growth and other factors contributed to a period of rapid residential property price inflation in Singapore from the middle of 2009. However, the government has successfully pursued policies to restrict this rise to the extent that residential property prices actually fell in 2014 and 2015.

(a) Use supply and demand analysis to explain why falling interest rates and continued income growth may have led to a rapid rise in residential property prices. [10]

(b) Discuss the policies that might be used by the Singapore government to reduce residential property price inflation. [15]

2016 (H2) Question 1

The price of a pair of jeans can be as little as $20 or as much as $500.

(a) Explain what might cause price elasticity of demand and cross   [10]
    elasticity of demand to be different for different products.
(b) Assess the likely effects of a rise in price of one brand of jeans on the [15]
    revenue earned by both retailers of that brand of jeans and those who sell
    other related goods.

2013 (H1)

'Market failures always exist, so reliance on the price mechanism alone is inevitably an unsatisfactory way of allocating scarce economic resources.'
(a) Explain how the price mechanism allocates scarce resources in a free   [10]
    market.
(b) Explain and evaluate one method that a government might use to bring   [15]
    about a more efficient allocation of resources when, for some reason, there
    is market failure.

2013 (H2) Question 1

Economics assumes rational decision-making by consumers, firms and government.
(a) Explain what is involved in rational decision-making both by consumers and [10]
    by firms.
(b) Discuss whether rational decision-making by consumers, firms and   [15]
    government always leads to an efficient allocation of resources.

2012 (H2) Question 1

Most brands of car are available in different models. A large rise in the cost of car manufacture and a rise in incomes are likely to affect the sales of various models of car in different ways.
(a) Explain how elasticities of demand can assist in understanding the effect of each [12]
    of these changes on the sales volume of different models of car.
(b) Compare and contrast the likely combined impact of both these changes on the [13]
    revenue earned from the sales of different models of car.

2007 (H2) Question 1

In 2005 the rate of Goods and Services Tax (GST) in Singapore rose from 3% to 50/0. Incomes rose by approximately 4.5% in 2005.
(a) Explain the likely effect of this change in GST on expenditure by consumers on [10]
    different types of goods.
(b) Discuss whether the combined effect of the rise in incomes and the rise in GST is [15]
    likely to cause the quantities of different types of goods sold to rise or fall.

APPENDIX

Article 1- Rolex demand hotter than at any time in the past 30 years says Govberg.
Adapted from WatchPro, Sept 13, 2018

"In my 30 years working in luxury watches, I have never ever seen the shortages of Rolex sports watches that are taking place now," says Danny Govberg, chief executive of Govberg Jewelers, a luxury watch destination in Philadelphia.
His comments came after reading a letter to the New York Post that asked whether the current difficulty to find certain Rolex models is limited to Republican states, particularly California.

"When you talk with retailers you discover that since Trump's arrival, Rolex watches have been flying out the door. Now remember, this is California, where Democrats outnumber Republicans 100 to 1 or something. I was wondering if that is true in New York City or another Democratic stronghold," a letter from "J.K." asks.
Mr Govberg certainly sees the same shortage in Philly, and says it is actually a global phenomenon.

"It used to be just the Daytona model. Now it's the entire sports line. And it is not just a United States issue, it's worldwide," he adds.

The story is not so much one of a Rolex drought caused by the watchmaker, but an astonishing increase in demand.

Mr Govberg believes this is part of a wider increase in the desirability of luxury sports watches that can be worn all day in the office or at the beach club and kept on the wrist at a swanky dinner event when people used to switch to dress watches.

The shortage of Rolex sports models is driving up its prices. Models like Rolex's Submariners and Patek Philippe Nautilus pieces are changing hands for more than 50% above retail price for new watches.

Questions:

1. Explain why Rolex faced a surge in demand for its watches.

2. Explain how the increase in demand of Rolex watches would lead to an increase in its prices.

Article 2 - Why Are Oil Prices Dropping Sharply? Global Economy Forecasts Lowered

Oil prices jumped in September and early October of this year (2018), but have dropped $20 a barrel in the last few weeks. The sharp turnaround is attributed to OPEC's inability to cut supply, but this is old-fashioned thinking. What's happening now is wild swings in thinking about the future.

Expectations of future supply and demand play a large role in current prices. And demand, in particular, is a bigger mover. Commodities traders can hold inventories in storage tanks if they think that prices will be higher in a few months, and producers can run wells at lower pumping volumes. When traders and producers expect falling prices, they can sell quickly from storage tanks and push their wells to maximum flow to capture today's prices.

Future demand, though, is highly variable. Routine variation in the world economy can cause demand over the next decade to rise or fall three percentage. Throw in the possibility of a global recession and potential drop in demand is even greater.

That's why oil prices tend to jump up and down. Current prices (as of this writing, $56) are about equal to year-ago prices. It's been just a bit over four years since prices were over $100, and less than three years since they were $27. Focus Economics, which compiles forecasts of countries all over the world, sees lower global economic growth being forecast for both 2019 and 2020.

In the oil market, though, increasing supply means only a little from inventories, a bit more from increased fracking in the next year, and a lot of new exploration over the next ten years. For demand, higher prices will lead drivers to cut back driving, but habits are slow to change. High gasoline prices push a change from big pickup trucks and SUVs to smaller cars, but changing the entire inventory of motor vehicles on the roads takes even longer than a decade. Energy used in power plants, ships and big-rig trucks also changes slowly, as the engines and other machinery are swapped out.

Sharp gyrations are likely as global business expectations rise and fall. That will be the key to future oil prices. Right now, analysts are a bit gloomy, probably due to trade tensions, political disruptions in Europe and the United States, as well as uncertainty about China. Look for more volatility in the months to come.

Adapted from Forbes, Nov 15, 2018

Questions:

1. Explain how the above events will affect demand and supply of oil in the global economy.

2. Using a demand and supply diagram, explain how changes in demand and supply may result in the fall in oil prices.

3. Using demand and supply analysis, explain how the falling oil prices will affect the equilibrium price and quantity of the automobile market.