

ANGLO-CHINESE JUNIOR COLLEGE JC1 Economics 2023

PRICE MECHANISM & ITS APPLICATIONS

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Reference Text (Optional):

1. Karl Case, Ray Fair, Sharon Oster. <u>Principles of Economics</u>, 11th Edition, Pearson, Chapters 3-5

WHAT IS THIS TOPIC ABOUT?

Why are the prices of the latest smartphones like the iPhone 14 and Samsung Galaxy S22 so high when they are first introduced in the market? Why are air tickets much more expensive during school holidays? How has the entry of Grab and Gojek affected the revenue of traditional taxi companies like ComfortDelGro? These are some of the questions which will be dealt with in this topic.

In the previous topic, you learned about the Central Economic Problem of scarcity: a situation where there are unlimited wants but limited resources. In this topic, you will learn about how markets deal with this problem, by allocating resources efficiently. You will also learn how economic agents make decisions to pursue their self-interest in markets.

LEARNING OUTCOMES

Enduring Understanding: [for students to understand and remember]

- Market prices and outputs tend to adjust towards a new equilibrium when there are changes in factors affecting consumers and producers' decisions.
- Elasticity concepts explain the magnitude of change in equilibrium price and quantity, arising from changes in demand and supply conditions.
- Elasticity concepts have practical applications for producers' business decisions and governments' policy decisions.

Essential Questions:

- 1 How do markets allocate scarce resources efficiently?
- 2 How may elasticity concepts help economic agents in their decision making process?

<u>Note:</u> Essential questions are meant to help students thoroughly understand the whole topic. Their aim is to stimulate thinking, provoke inquiry, and spark discussion by students. By answering essential questions, students will be engaged in uncovering the depth and richness of the topic.

Article: Bicycle sales get boost from Covid-19 pandemic, as more turn to cycling for leisure and transport

(Adapted from The Straits Times, 10 August 2020)

Thanks partly to the Covid-19 pandemic, cycling is fast gaining popularity not only as a leisure activity, but also as a mode of transport. This is so much so that bicycle shops are running out of stock and prices of popular brands have shot up.

Secondhand Brompton bicycles for instance, are advertised for as much as \$5,000 to \$8,000 a piece because new ones - which cost around \$2,500 - are in short supply. Brand new Dahon bikes are also sold for as much as 40 per cent more than before. Mr William Loo, 69, who imports the KHS range of bicycles, said sales had grown by 30 per cent this year. "Because of Covid-19, people are exercising a lot more", he said. "I have never sold so many bicycles before.

Mr Paul Fam, 55, who owns a bicycle shop in Paya Lebar, said his inventory is also running low, but added that the growing popularity of bicycles has spawned several new sellers. "Even durian sellers and phone cover sellers are now selling bicycles," he said.

"Consumers are shifting spending away from traditional leisure activities towards what we call solitary leisure activities... and cycling would be one." The growing interest in cycling is in line with the trend in other parts of the world as commuters turn to cycling to avoid crowded public transport.

The cycling boom amid COVID-19 has resulted in shortages for bicycle components due to production stoppages, plant shutdowns, port and border closures and longer shipping times.

Questions:

1) How would you explain the basis of the decision a consumer makes to buy a new bicycle when the price of bicycles has shot up?

2) How would you explain the basis of the decision made by a durian seller or a phone cover seller to start selling bicycles?

Note: Do revisit the above questions after you have completed the lectures on the Interaction of Demand and Supply.

1. THEORY OF DEMAND

1.1 Consumer's Behaviour

- The consumer aims to maximise his utility (i.e. satisfaction) whenever he decides to consume a good.
- With this objective in mind, the consumer needs to decide which good to consume and if applicable, how many units of that good to consume.
- However, the consumer is constrained by his limited resources (i.e. disposable income) and thus faces a budget constraint to spend on the goods and services he wants to consume.

1.2 Concept of Demand

- **Demand** refers to the <u>quantity of a product that buyers are willing and</u> <u>able to buy at various prices in a period of time, ceteris paribus.</u>
 - Ceteris paribus is a Latin phrase that generally means "holding other things constant". In Economics, we include this assumption when analyzing how one variable affects another. Hence, the need to include ceteris paribus when defining what demand is as we are assuming that price is the only factor that changes.
 - The willingness to purchase depends on the taste and preference of the consumer i.e. whether the consumer wants the good.
 - The ability to purchase depends on one's disposable income i.e. the income the consumer earns after deduction of taxes, as well as his wealth (value of assets owned).
 - Demand is effective when consumers are both willing and able to pay for the goods and services.

1.3 Types of Demand

1.3.1 Individual Demand

- It reflects the quantity demanded (Q_{dd}) for a good by an individual consumer at different prices.

1.3.2 Market Demand

- This refers to the combined demand of all individual consumers in the market for a good.
- It is derived by summing up the quantity demanded by each individual consumer at each possible price.
- From Table 1, assuming only two consumers in the market, the market quantity demanded for good A at \$4 is 40 units.

Price per unit of good A	Q _{dd} by consumer 1	Q _{dd} by consumer 2	Total Q _{dd} in the market
\$5	10	15	25
\$4	20	20	40
\$3	30	25	55

Table 1



1.3.3 Derived Demand

- A good could be used in the production process of another good.
- Its demand is thus derived from the demand for the product it is used to produce.
- For example, the demand for rubber is derived from the demand for tyres, as rubber is used to produce tyres.
- Generally, demand for all factors of production / inputs / resources (land, labor and capital) can be described as such, since they are used in the production of final goods and services.

1.4 Law of Diminishing Marginal Utility

Suppose you are in the canteen and wishes to eat waffles for lunch. You bought one waffle and began to eat. After which, you decided on a second waffle and a third and then a fourth, until you could not eat anymore. How do you think the satisfaction level from each additional waffle differs?

No. of waffles	Marginal Utility	
1	15	
2	12	
3	8	
4	1	
5	-2	

Table 2

- Consider the above figures of marginal utility derived by an individual when buying waffles.
- Marginal utility refers to the additional satisfaction gained by the consumption of one more unit of a good or service.
- The first waffle gives the highest marginal utility. As one eats the second waffle, the marginal utility that one gets from that waffle falls.
- The law of diminishing marginal utility explains that as more units of a good are consumed, additional units will provide less additional satisfaction or utility than previous units, even though total utility increases.
- The law of diminishing marginal utility offers an explanation of why demand curves slope downward. With marginal utility decreasing, consumers are generally less willing to pay the same price for additional units of the same good consumed. Hence, price and quantity demanded of a good are observed to be inversely related (i.e. sharing a negative relationship).

1.5 Law of Demand

The law of demand states that over a given time period, ceteris paribus, the quantity demanded of a good is inversely related to its price.

- As price increases, quantity demanded of a good decreases.
- As price decreases, quantity demanded of a good increases.

1.6 Demand Curve

- The demand curve is downward sloping and this can be understood using the Law of Diminishing Marginal Utility and Law of Demand.
- **Demand** looks at the entire demand curve (e.g. DD curve in Figure 1) that shows the <u>various quantity demanded that consumers are willing</u> and able to purchase at different price levels in a given time period.
- In contrast, **quantity demanded** refers to a point on the demand curve (e.g. point A in Figure 1) that shows <u>a specific quantity demanded at a specific price in a given time period.</u>

1.6.1 Movement Along the Demand Curve

- At the price Po, the quantity demanded is Qo.
- Changes in the price of a good will lead to changes in its quantity demanded, ceteris paribus.
- As shown in Figure 1, a decrease in price of good A from P_0 to P_1 will cause the quantity demanded to increase from Q_0 to Q_1 .
- This is illustrated by a movement from point A to B along the same demand curve DD.



1.6.2 Shifts of a Demand Curve

- A change in demand is graphically represented by a shift of the entire demand curve: a different quantity being demanded at each possible price.
- Graphically, assuming that DD_0 is the original demand curve, DD_1 and DD_2 reflects an increase and decrease in demand respectively.
- This happens when any other factor affecting demand, other than the price of the product itself, has changed. What could some of these factors be?



Change in Demand	Graphical Representation	Interpretation	Holding price constant At P ₀
Increase	Rightward shift of demand curve from DD₀ to DD1	Quantity demanded of good A has increased for each possible price	Quantity demanded increases from Q₀ to Q1
Decrease Leftward shift of demand curve from DD ₀ to DD ₂		Quantity demanded of good A has decreased for each possible price	Quantity demanded decreases from Q ₀ to Q ₂

1.7 Factors affecting the Demand Curve

Try it yourself:

The prices of grocery items in Singapore - bananas (Adapted from The Straits Times, 3 Dec 2021)

The price of bananas has hovered around \$2.40 a kg since September 2019. It rose by about 1 per cent annually over the past five years.

Bananas are among Singapore's top fruit imports, together with watermelons, papayas, navel oranges and Fuji apples. There were 427,697 tonnes of fruit imported last year, down from 428,869 in 2019. The prices of fresh fruit, including bananas, have risen amid supply chain disruptions coupled with more people adopting healthier lifestyles and diets. This is also partly due to more people working from home as the economy recovers.

Questions:

1) What are some factors mentioned above that have caused a change in the demand for bananas?

2) How has the demand for bananas affected its price?



Demand"

Demand can be affected by various factors/conditions. The list of factors affecting demand below is not exhaustive.

Household Income

- Income is the sum of all forms of earnings received by a household in a given period of time → affects the <u>purchasing power</u> of household and its <u>ability to purchase</u> goods and services.
- Changes in household income affects demand differently, depending on whether it is a normal or inferior good.

	Normal Good	Inferior Good
DefinitionGoods for which demand will increase when income increases (positive relationship).		Goods for which demand will decrease when income increases (negative relationship).
Examples	Cars, condominiums, potatoes, rice	Imitation goods, house-brands products, poor quality items

Tastes and Preferences

- A change in consumer tastes or preferences favorable to a product → affects one's <u>willingness</u> to purchase → demand will increase.
- For example, an increasing emphasis on a healthy lifestyle will lead to consumers switching from drinking soda and fizzy drinks to healthier choices such as non-carbonated drinks → Demand for soda thus decreases while demand for non-carbonated drinks increases.

Prices of Related Goods

• Substitutes

- Substitutes are defined as <u>goods that satisfy a similar want and</u> <u>can thus serve as replacements for one another</u>.
- The demand for a good (e.g. margarine) is likely to change when the price of its substitute (e.g. butter) changes.
- A fall in the price of margarine → increase in quantity demanded of margarine → demand for butter will decrease as consumer switch from purchasing butter to margarine.
- Other examples can include Coke and Pepsi, desktops and laptops, shoes and sandals, etc.
- Complements
 - Complements are defined as goods that are consumed together.
 - The demand for a good (e.g. petrol) can also be affected by a change in the price of a complementary good (e.g. price of cars).
 - Price of car decreases → quantity demanded for car increases → demand for petrol increases as petrol is needed to fuel the car.

Consumers' Expectations of Future Prices

• Consumers' expectations about future product prices, product availability, future income etc., can change the demand for the good in the current period.

- For example, if people expect the prices of cars to fall soon → less willing to buy cars at current price → current demand for cars falls.
- If people expect the housing prices to rise in the near future \rightarrow buy their new homes now \rightarrow increasing the current demand of housing \rightarrow this is sometimes referred to as speculative demand.

Population

- Changes in population size or structure will affect the demand for a product in a given period of time.
- For example, an increase in population size due to relaxation of immigration laws → increase in demand for food, clothing, and housing and most other goods and services.
- A change in the age or gender structure of the population will affect demand for specific products e.g. an ageing population → higher demand for medical and health-related products and services.

Climate and Weather

- Seasonal changes can also affect the demand for goods and services.
- For example, during haze season → demand for masks and air purifiers increases.

Government Policies

- Changes in government policies, in the form of taxes, subsidies or legislation, which affect consumers' decisions, may change demand for specific goods and services.
- Decrease in income tax \rightarrow disposable income increases \rightarrow ability to purchase goods and services increases \rightarrow demand increases.
- Legislations, such as the anti-smoking laws (introduction of a ban on smoking in all entertainment nightspots) → demand for cigarettes falls.

Availability of Credit

- Credit refers to a method of paying for goods or services at a later time, usually paying interest as well as the original amount.
- Changes in the availability of credit may change demand for specific goods and services, in particular, big ticket items that often require consumers to borrow money from commercial banks. Example: Cars and houses.
- The availability of credit may change due to changes in interest rates or changes in government regulations.
- Commercial banks charge interest for the loan of money. Interest rate refers to the cost of borrowing money from financial institutions such as commercial banks.
- When interest rate is reduced → cost of borrowing money is lower i.e., loans are cheaper → Consumers are more likely to borrow money to purchase big ticket items as the cost of purchase (in terms of monthly payments) decreases → increasing the demand for these goods.

Exchange Rates

- The exchange rate is the price at which currencies are traded. It is expressed as how many units of foreign currency one unit of domestic currency can buy.
- A country's currency exchange rate influences the prices of its exports (domestically produced goods that are sold abroad) and imports (goods produced in foreign countries that are brought in).
 - If the Singapore dollar appreciates, the Singapore dollar strengthens or is more valuable compared to other currencies. This means other currencies appear less expensive to us.
 - As we can buy foreign currency more cheaply, the prices of the foreign country's products in terms of Singapore dollar appear lower to us.
 - This encourages us to buy more imports from foreign countries, which is expressed by an increase in demand for imports from foreign countries.
 - At the same time, foreigners will find it more expensive to purchase the Singapore dollar.
 - Thus, the price of goods produced in Singapore (in terms of foreign currency) will appear more expensive to foreigners, resulting in lower demand for goods produced in Singapore (exports).
 - Locals may also shy away from locally-produced goods and turn to imports as a substitute. These changes will lead to a fall in demand for locally-produced goods (goods produced by Singapore).
- Conversely, when a country's currency depreciates, it means that the currency weakens or is less valuable compared to other currencies. In this case, there will be a decrease in demand for imports and an increase in demand for locally-produced goods.

<u>Note:</u> We will revisit the concept of exchange rates in your JC2 macroeconomics syllabus.

Key Learning Points in Section 1:

- ✓ The demand curve shows that there is an inverse relationship between the price of a good and the quantity demanded of the good itself, ceteris paribus.
- ✓ A change in any demand factor except the price of the good itself will cause the demand to change and it is represented by a shift of the demand curve.

2. THEORY OF SUPPLY

2.1 <u>Producer's Behaviour</u>

- The producer aims to maximise profit which is the difference between the total revenue he earns and total cost incurred in production.
- With this objective in mind, the producer needs to decide what good to produce, how many units of each good to produce and what production method to use.
- Like the consumer, the producer is constrained by the amount of resources available for the production of the good, for example, limited capital, raw materials, production space, etc.

2.2 Concept of Supply

Supply refers to the <u>quantities of a product that producers are willing and</u> <u>able to sell at various prices in a period of time, ceteris paribus.</u>

2.3 Types of Supply

2.3.1 Individual Supply

A producer's supply schedule would show the various quantities he/she is willing to supply at various price levels.

2.3.2 Market Supply

- This is the combined supply of all producers in the market for a good.
- It is derived by summing up the quantity supplied by each producer at each possible price.

2.4 Law of Supply

The law of supply states that over a given time period, ceteris paribus, the quantity supplied of a good rises when the price of the good rises.

- As price increases, quantity supplied of a good increases.
- As price decreases, quantity supplied of a good decreases.

2.5 Supply Curve

- The supply curve is upward sloping. This can be understood in two ways:
 - <u>Due to rising marginal cost (MC)</u>. Marginal cost refers to the additional cost incurred from producing additional unit of output. MC increases as producers increase their output because they will likely have to draw resources from other uses and these resources may be less suitable or cost more to employ → producers raise prices to cover the rising MC so as to keep profits stable.
 - <u>Due to higher revenue</u> that some producers can potentially gain from higher prices. These producers will want to increase quantity supplied when prices rise.
- Supply looks at the entire supply curve (e.g. SS curve in Figure 3) that shows the various quantity supplied that producers are willing and able to sell at different price levels in a given time period.



SLS Lesson: "Theory of Supply" • In contrast, quantity supplied refers to a point on the supply curve (e.g. point B in Figure 3) that shows a specific quantity supplied at a specific price in a given time period.

2.5.1 Movement Along the Supply Curve

- At the price Po, the quantity supplied is Qo.
- Changes in the price of a product will lead to changes in its quantity supplied, ceteris paribus.
- As shown in Figure 3, an increase in price from P₀ to P₁ will cause the quantity supplied to increase from Q₀ to Q₁.
- This is illustrated by a movement from point A to B along the same supply curve SS.



Figure 3: Change in quantity supplied

2.5.2 Shifts of a Supply Curve

- A change in supply is graphically represented by a shift of the entire supply curve: a different quantity being supplied at each possible price.
- Graphically, assuming that SS_0 is the original supply curve, SS_1 and SS_2 reflects an increase and decrease in supply respectively.
- This happens when any other factor affecting supply, other than the price of the product itself, has changed. What could some of these factors be?



Change in Supply	Graphical Representation	Interpretation	Holding price constant At P ₀
Increase	Rightward shift of supply curve from SS ₀ to SS ₁	Quantity supplied of good A has increased for each possible price	Quantity supplied increases from Q ₀ to Q ₁
Decrease	Leftward shift of supply curve from SS ₀ to SS ₂	Quantity supplied of good A has decreased for each possible price	Quantity supplied decreases from Q0 to Q2

2.6 Factors affecting the Supply Curve

Try it yourself:

The prices of grocery items in Singapore - fresh milk (Adapted from The Straits Times, 3 Dec 2021)

SLS SLS Lesson: "Factors

Affecting

Supply"

Fresh milk had price increase of at nearly 4 per cent annually over the past five years. The rising cost of maintaining livestock also adds to the price of fresh milk. Climate change plays a significant role in the rising cost with more extreme weather affect the growth of animal feed.

Singapore imports most of its dairy products from Australia, New Zealand and Thailand. The spike in freight prices has a large impact on milk.

Fresh milk prices rose to \$3.20 a litre in January 2019, up from \$2.70 to \$2.90 previously. They edged up further to \$3.37 in 2020 and have since remained around that level.

With pandemic-related restrictions imposed in March 2020, supply disruptions due to the pandemic have created bottlenecks for perishable products like milk.

Questions:

1) What are some factors mentioned in the article that has affected the supply of milk in Singapore?

2) How has the supply of milk affected its price?

Supply can be affected by several factors/conditions. The list of factors affecting supply below is not exhaustive.

Prices and Availability of Resources/Inputs

- Changes in the availability of inputs/resources can lead to changes in their prices.
- Higher input/resource prices \rightarrow higher costs of production \rightarrow supply decreases.
- Lower input/resource prices \rightarrow lower costs of production \rightarrow supply increases.
 - For example, the world price of oil fell from more than \$100 per barrel in 2013 to below \$50 in 2016 → Cab drivers faced lower petrol prices and airline faced lower fuel cost → supply of cab and airline services increase.

Productivity Level

- Productivity level refers to the quantity of output produced per unit of input, e.g. output per unit of labour.
- Technological improvements such as the development of a new method of production or the invention of a new machine → higher productivity level → increased supply.
 - For example, the introduction of fertilizers, the development of complex farm machinery, and the use of bio-engineering has increased farm productivity significantly → yield per acre of corn production in the United States has increased five-fold due to the increase in productivity.

Government Policies

- Government policies in the form of taxes, subsidies, government regulations, and buffer stocks schemes can affect supply.
- Taxes on resources e.g. oil → increases costs of production (in the form of electricity costs) → decreases supply of goods and services.
- Subsidies to producers \rightarrow government absorbs part of production cost \rightarrow helps to lower producers' production cost \rightarrow increases supply of goods and services.
- Restriction on employment of foreign labour \rightarrow increases cost of hiring workers \rightarrow decreases supply of goods and services.
- The production of agricultural products are susceptible to weather conditions. Governments may implement buffer stocks schemes to safeguard their countries' food security in the event of a bad harvest. Under such schemes, governments purchase and store agricultural products as buffer stocks. The buffer stocks are released and sold in the market in times of low harvest. As such, supply of agricultural products would increase.

Prices of Other Goods

- Goods in Competitive Supply
 - > These are goods that are produced using the same resources \rightarrow compete for the same resource.

For example, palm oil and rubber need to be grown on land.

- $\circ~$ A plot of land in Johor used for producing palm oil cannot be used at the same time for producing rubber.
- When the price of palm oil rises \rightarrow quantity supplied of palm oil increases \rightarrow supply of rubber falls as farmers switch to producing more palm oil instead of rubber.
- Goods in Joint Supply
 - These are goods produced jointly, one of which is usually a byproduct of the other, or produced by using a different part of the same resource.
 - E.g. petrol and other grade fuels such as diesel and paraffin are produced from crude oil refining.
 - Price of petrol increases → quantity supplied of petrol increases → supply of diesel increases.

Weather / Nature / 'Random Shocks' / Unpredictable Events

- Favorable weather conditions can improve crop harvests → increasing the supply of agriculture crops. The reverse happens if weather conditions are unfavorable.
- SARS, Bird Flu, 'Mad Cow' disease, oil spills are examples of supply shocks that can destroy crops, farm animals or prevent delivery of goods across nations → reducing supply of many goods and services.

Number of Sellers

• Market supply is made up of the supply by individual sellers in a market. More sellers enter the market \rightarrow market supply increases.

Producers' Expectations of Future Prices

 If producers expect a higher selling price for their product in the future, they will offer fewer units for sale now at the current market equilibrium price → reduces current supply.

Key Learning Points in Section 2:

- ✓ The supply curve shows that there is a direct relationship between the price of a good and the quantity supplied of the good itself, ceteris paribus.
- ✓ A change in any supply factor except price of the good itself will cause the supply to change and it is represented by a shift of the supply curve.

In the next section, we will look at how markets adjust towards an equilibrium.

3. THE MARKET: INTERACTION OF DEMAND AND SUPPLY

Introduction to Markets



<u>Note:</u> In a free market where there is no government intervention, consumers and producers are identified as the economic agents participating in the exchange of goods and services.

Before we look into how markets operate and adjust towards an equilibrium, we would first look at how consumers participate in the market.

3.1 Market Equilibrium

- Market equilibrium analysis helps us to understand why prices in realworld markets change in certain ways (rise, fall or remains stable).
- Price changes can be explained by the interaction of demand and supply forces.
- The point where the market demand curve and supply curve intersects is known as the market equilibrium. This is a point of stability as there is no tendency for price to change.
- There is neither surplus nor shortage in the market at the market equilibrium (i.e. the market is cleared).
 - A **surplus** occurs when <u>quantity demanded is less than quantity</u> <u>supplied at a given price</u>
 - A *shortage* occurs when <u>quantity demanded is more than</u> <u>quantity supplied at a given price</u>
- With reference to Figure 5: At equilibrium price (P₀), Quantity demanded (Q_{dd}) = Quantity supplied (Q_{ss}) = OQ₀



How market equilibrium is established:

Referring to Figure 5, if the producer sets price at P₁,

Quantity demanded = \underline{O}_{d1} , Quantity supplied = \underline{Q}_{s1}

A <u>surplus</u> $(Q_d < Q_s)$ of <u> $Q_{s1} - Q_{d1}$ </u> exists.

Consequence:

• The producer has to sell at a lower price to clear his surplus, as a decrease in price will lead to an increase in quantity demanded from OQd₁ to OQ₀, i.e. A downward pressure will be exerted on the price P₁ until it reaches equilibrium price P₀, and the surplus is cleared.

If the producer sets price at P₂,

Quantity demanded = \underline{Q}_{d2} , Quantity supplied = \underline{Q}_{s2}

A <u>shortage</u> $(Q_d > Q_s)$ of <u> $Q_{d2} - Q_{s2}$ </u> exists.



SLS Lesson: "Market Equilibrium"

Consequence:

• The producer will increase his price to eliminate the shortage, as an increase in price will lead to decrease in quantity demanded from OQ_{d2} to OQ₀,

i.e. An upward pressure will be exerted on the price P_2 until it reaches equilibrium price P_0 , and the shortage is cleared.

Summary:

• The adjustment of price is the rationing mechanism in free markets. When there is a disequilibrium in a market, the price will adjust until the market clears.

3.2 Movement to a New Equilibrium

When supply and/or demand forces change, the equilibrium price and/or quantity will also change as the market adjusts to a new equilibrium. Below are some cases of how this may take place.

<u>Case 1</u>: There is a poor outlook for Singapore's economy with a looming recession → consumers in Singapore become more prudent and cut down on their spending.

• Initially, the market equilibrium is at $X \Rightarrow$ Market price at P₀ and number of units of condominiums bought and sold at Q₀.



- Expectations that future income levels may fall due to negative economic growth \rightarrow a decrease in demand from DD₀ to DD₁.
- At current price P_0 , *ceteris paribus*, a situation of surplus arises (surplus of Q_0Q_{01}) \rightarrow downward pressure on the price of condominiums as producers lower prices to make them more appealing to consumers
- Decrease in price of condominium \rightarrow quantity supplied decrease and quantity demanded rise \rightarrow decreasing the amount of surplus.
- The price of condominiums will continue to fall until the market reaches a new equilibrium, indicated by point Y, in which the market clears, since quantity demanded equals quantity supplied.
- The new market equilibrium price established is lower at P_1 and the units of condominium bought and quantity sold is lower at Q_1 .



SLS Lesson: "Movement to a New Equilibrium"

<u>Case 2</u>: The government decides to re-design Singapore's city centre to include homes and recreational facilities side-by-side with business centres \rightarrow more land is released for such residential projects.



- Initially, market equilibrium is at X. Market price is at P₀ and number of units of condominiums bought and sold at Q₀.
- Increase in supply of land \rightarrow increase in supply of condominium \rightarrow rightward shift in SS curve from SS₀ to SS₁
- At current price P_0 , a situation of surplus arises (surplus of Q_0Q_{02}) \rightarrow downward pressure on price \rightarrow quantity demanded of condominium increases while quantity supplied of condominium falls \rightarrow reducing the surplus in market
- The price of condominiums will continue to fall until the market attains a new equilibrium, indicated by point Y, where the market clears and quantity demanded equals quantity supplied.
- The new market equilibrium price established is lower at P₁ and the units of condominium bought and sold is higher at Q₁.

Case 3: The effects of concurrent changes in demand and supply (case 1 and 2 happen simultaneously)



- Initially, market equilibrium is at X. Market price is at P₁ and number of units of condominiums bought and sold at Q₁.
- Reduced demand will cause both equilibrium price and quantity to fall.
- Increased supply will cause equilibrium price to fall but equilibrium quantity to rise.
- Equilibrium price will fall because both changes will lead to this effect.

• Whether equilibrium quantity will ultimately rise or fall depends on whether demand or supply changes by a larger extent.

Scenario 1:

- > Assuming the increase in supply is greater than the decrease in demand, indicated by SS_0 to SS_1 and DD_0 to DD_1 ,
- > New equilibrium formed at point $Y \rightarrow$ equilibrium quantity will rise from Q_1 to Q_2 and price falls from P_1 to P_2

Think about this!

- Scenario 2: What will the market equilibrium be if the decrease in demand is greater than the increase in supply?
- Scenario 3: What will the market equilibrium be if the decrease in demand is equal to the increase in supply?

3.3 Equilibrium Quantity and Society's Welfare

	Consumer Surplus	Producer Surplus	
Definition	The difference between what consumers are willing to pay for a good (indicated by the demand curve) and what they actually pay (i.e. current market equilibrium price). Consumer surplus is hence the gain to consumers.	The difference between what producers are willing to accept in order to produce a good (as indicated by the supply curve) and what they actually receive (i.e. current market equilibrium price). Producer surplus is hence the gain to producers.	
Formula Value to buyers - Amount paid by buyers		Amount received by sellers - value to sellers	
Illustrated by	Demand curve	Supply curve	
Area on diagram (Figure 9)	Total consumer surplus for Q ₀ units is AP ₀ E	Total producer surplus for Q₀ units is CP₀E	
	Society's welfare = Consumer + Producer Surplus		
Area on diagram	Area \triangle AP ₀ E + Area \triangle CP ₀ E		



SLS Lesson: "Consumer Surplus and Producer Surplus"



producers.



- Figure 10 shows that if production is reduced from Q_0 to Q_1 , there will be a loss of consumer surplus of area ACD and loss of producer surplus of area BCD.
- Deadweight loss can thus be understood as the total loss of • producer and consumer surplus that is not offset by a gain to anyone else in society, represented by area ABC.

- Here, the deadweight loss arises due to underproduction of Q_1Q_0 , which means resources have not been allocated in a way that maximizes society's welfare.
- Thus, allocative efficiency has not been achieved and economists describe this as market failure*.
- Similarly, producing beyond Q_0 will also lead to deadweight loss.
- Hence, competitive markets usually maximize society's welfare, at the equilibrium price and output.

*Note: Market failure would be covered in detail in the next chapter.

Key Learning Points in Section 3:

- Any change to demand and supply condition will cause the market equilibrium to adjust to eliminate any shortage or surplus.
- ✓ When there are concurrent changes in demand and supply conditions, the net effects on equilibrium price and quantity will depend on the relative extent of changes in demand and supply.
- ✓ At the equilibrium point, the sum of consumer and producer surplus is maximized; i.e society's welfare is maximized.

Think about this!

- How does demand and supply determine the exchange rate of Singapore Dollar (price of Singapore Dollar) in the exchange rate market?
- Can demand and supply determine the wage rate (price of labour) in the labour market?

You may refer to Section 10 for more details!

4. PRICE AS A MECHANISM IN RESOURCE ALLOCATION

4.1 The Price Mechanism

- The price mechanism is a term used to describe the interaction of demand and supply to determine the allocation of scare resources between competing uses through the use of price signals.
- This happens in a free-market economy where there is no government intervention to command and control decisions of consumption and production. As such, decisions about production and consumption are left to those who are willing and able to participate in the marketplace.
- Under certain assumptions, the price mechanism will allocate resources to maximize society's welfare; i.e. achieve an allocative efficient outcome.

4.1.1 The Functions of Price Mechanism in a Free Market Economy

In a free market economy, the price mechanism facilitates resource allocation through the following roles:

- i) **Signalling function:** Changes in prices provide information to <u>producers</u> and <u>consumers</u> about changes in market conditions. For example, if prices are rising due to higher demand, this is a signal to producers to expand production.
- ii) Incentive function: Changes in prices provide incentives for <u>producers</u> to reallocate their scarce resources. For example, rising prices act as an incentive for producers to allocate more resources to earn more profits.
- iii) Rationing function: Changes in prices enable scarce resources to be rationed to the <u>consumers</u> 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.

4.1.2 Diagrammatic Analysis Of The Role Of Price Mechanism



• Let us take a look at how we can explain and illustrate the roles of the price mechanism in incentivising, signalling and rationing.

- For example, Singapore's campaign against diabetes was relatively successful, resulting in a change in consumers' taste and preferences. Consumers thus switch from regular soda to diet soda.
- Demand for regular soda decreases while demand for diet soda increases, as illustrated in Figures 11 and 12 respectively.
- The price mechanism explains how fewer resources will be allocated to produce soda and more resources will be allocated to produce diet soda, therefore addressing the change in consumers' taste and preferences.
- Signalling function of price:
 - Fall in demand for regular soda → surplus of regular soda at existing price P₀ → downward pressure on price of regular soda → lowers profits earned per unit of regular soda → <u>signals</u> to producers to reduce quantity supplied → fewer resources will need to be allocated to produce the fewer units of soda of Q₀ to Q₁
- Incentive function of price
 - Rise in demand for diet soda → shortage of diet soda at existing price P₂ → upward pressure on price of diet soda → higher profits earned per unit of diet soda → this acts as an <u>incentive</u> to producers to increase quantity supplied → more resources will need to be allocated to produce larger units of diet soda of Q₂ to Q₃
- Rationing function of price:
 - Rise in demand for diet soda → shortage of diet soda at original price P_0 .
 - Upward pressure on price → some consumers became unwilling and unable to pay → quantity demanded decreases from Q_d to Q_3 as price increases from P_2 to P_3
 - Rising prices will help to <u>ration</u> the limited units of diet soda to consumers who are still willing and able to pay the higher price → new market equilibrium is established
- From Figures 11 and 12 above, new equilibriums are established in both markets. The sum of consumer and producer surplus is at the maximum → society welfare is maximized. In other words, price mechanism allocates resources in a way that yields the largest possible total benefits (surplus) received by buyers and sellers.

Key Learning Points in Section 4:

- \checkmark The price mechanism provides a signal to producers and consumers, and an incentive for them to produce and consume.
- ✓ Price is a rationing mechanism for goods, services and use of resources.

Notes:

• What you have learned so far is how prices are determined in markets and how prices provide signals for resource allocation. However, the price mechanism can fail to allocate resources efficiently and equitably. In the next topic on Market Failure, you will learn the concept of efficiency and the sources of market failure.

- In the next section, you will progress to understand the following:
 - a. Elasticity concepts: When demand or supply changes, what determines the extent of change in price and quantity of a good?
 - b. How would demand and supply analysis be of practical applications to businesses and governments?



5. ELASTICITY OF DEMAND

- The law of demand states that when the price of a good increases (decreases), quantity demanded will decrease (increases), ceteris paribus.
- Although this helps us to understand the <u>direction of change</u> (i.e., increase/decrease) in quantity demanded when the price of a good changes, the law of demand is unable to help us understand the <u>extent</u> <u>of change</u> in quantity demanded (i.e. how much is the increase/decrease).
- Elasticity of demand is the measure of the responsiveness of quantity demanded of a good to changes in its price or non-price determinants, ceteris paribus.
- There are three types of Elasticity of Demand which could help to determine the magnitude of change of demand:
 - ✓ Price Elasticity of Demand (PED)
 - ✓ Cross Elasticity of Demand (XED)
 - ✓ Income Elasticity of Demand (YED)

5.1 Price Elasticity of Demand (PED)

- Definition: PED is a measure of the <u>degree of responsiveness of</u> <u>quantity demanded to a change in the price of the good itself, ceteris</u> <u>paribus.</u>
- Formula: Percentage change in quantity demanded divided by the percentage change in the price of the good itself.

Price Elasticity of Demand =
$$\frac{\%\Delta \text{ in Qdd}}{\%\Delta \text{ in Price}}$$

- Interpretation of sign: Due to the law of demand, PED is usually a negative value.
 - However, due to convention, PED is usually displayed without the negative sign and only the absolute value is considered.
- Interpretation of magnitude: If we ignore the sign, the price elasticity of demand can vary from zero to infinity.
- Therefore, to explain the effects of a given change in supply (represented by a shift in the supply curve), the concept of PED can be used.
- PED can help to determine the extent of the changes in equilibrium quantity caused by a change in equilibrium price (due to a change in supply), as well as the effect on total revenue/total consumer expenditure.



Price elasticity of demand	Interpretation of magnitude	Example	Diagram
Price Elastic Demand (1 < PED < ∞)	Demand is price elastic → a change in the price of the good itself brings about a more than proportionate change in quantity demanded, ceteris paribus	A 10% decrease in the price of good A (P _A) \rightarrow 20% increase in the quantity demanded of good A (Q _A). PED= $\left \frac{(120-100)/100}{(27-30)/30}\right $ = 2	Price of Figure 13 good A (\$) 30 27 0 $100 \rightarrow 120$ SS ₀ SS ₁ Qty of good A
Price Inelastic Demand (0 < PED < 1)	Demand is price inelastic → a change in the price of the good itself brings about a less than proportionate change in quantity demanded, ceteris paribus	A 10% decrease in the price of good B (P _B) \rightarrow 5% increase in the quantity demanded of good B (Q _B). PED= $\left \frac{(105-100)/100}{(27-30)/30}\right $ = 0.5	Price of good B (\$) 30 27 0 100 105 Figure 14 SS_0 SS_1 DD Qty of good B

Perfectly Price Elastic Demand $(PED = \infty)$	Demand is perfectly price elastic → A change in the price of the good itself will bring about an infinite change in quantity demanded, ceteris paribus.	A slight increase in price of good C → the quantity demanded of good C drops to zero. This means price does not change regardless of how supply changes. This is because quantity demanded is extremely sensitive to price changes. When supply decreases, price should increase due to a shortage arising. However, quantity demanded is highly responsive to price changes for perfectly price elastic demand, and hence drops to 0. Thus, the shortage clears entirely without a need for price to rise.	Price of Figure 15 good C (\$) Po Q1 Q1 Q0 Q1 Q0 Qty of good C A perfectly price elastic demand is characterized by a horizontal demand curve This diagram illustrates the demand for a perfectly competitive producer*. (* Note: You will learn more about this in Market Structure)
Perfectly Price Inelastic Demand (PED = 0)	Demand is perfectly price inelastic → A change in the price of the good itself will not bring about any change in quantity demanded	The market has a fixed demand at Q_0 , as quantity demanded at all price levels is Q_0 . Therefore, demand is perfectly price inelastic $\rightarrow 0\%$ increase in the quantity demanded of good D (Q_d).	Price of Figure 16 SS_0 P_0 P_1 Q_0 Q

Notes:

- Graphically, the more price elastic the demand, the gentler the slope of the demand curve. However, the slope of the demand curve is only a rough estimate of the PED value.
- The application of perfectly price elastic demand and perfectly price inelastic demand to the real-world context is limited. However, such extreme points of PED values serve as useful reference points for the purpose of comparison.

Try it yourself:

Table 1: Estimates of Price Elasticity of Demand for goods and Services in the USA

Product	Price Elasticity of Demand
Medical Services	-0.22
Cars	-1.20
Cigarette	-0.35
Transatlantic air travel	-1.30

Source: Essential of Economics, Fifth Edition John Sloman & Dean Garratt

Questions:

1) Which of these goods or services has a price elastic demand, and which has a price inelastic demand?

2) Suggest possible reasons for your responses above.

5.2 Factors Influencing Price Elasticity of Demand

Availability and Closeness of Substitutes

Availability of substitutes

- The more substitutes available \rightarrow the more price elastic the demand for the good
 - This is because consumers can easily switch to other alternatives when the price of a good increases.
 - Example: When the price of Coca Cola increases \rightarrow its quantity demanded will fall more than proportionately as there are many substitutes such as Pepsi etc.
- Definition of goods/services broadens → demand becomes less price elastic
 - This is due to fewer substitutes available.
 - Example: Beverages, a broad category, has a fairly price inelastic demand because there are no good substitutes for beverages. However, soft drinks, a narrower category, have a more price elastic demand because it is easier to find substitutes for soft drinks such as fruit juices and mineral water.

Closeness of substitutes

- The closer the substitutes are in terms of quality and features, the more price elastic the demand is.
 - $\circ~$ When the price of one good increases \rightarrow consumer will quickly switch to its relatively close substitutes.



"Price Elasticity of Demand" $\circ~$ Example: Dasani mineral water and Ice Mountain mineral water are close substitutes.

Percentage of Income spent on the Good

- Goods that take up a large proportion of a household's income and expenditure \rightarrow more price elastic demand
- This is because consumers will be more sensitive to its price change
 - Example: price of a pack of mints rises from 25 cents to 35 cents \rightarrow consumers are not likely to notice the 40% increase in the price as it only constitutes a very small portion of income \rightarrow not likely to cut down their consumption very much \rightarrow demand is price inelastic.
 - However, a 40% increase in price of car is significant to consumers
 → more than proportionate decrease in quantity demanded of cars
 → demand is price elastic.
 - o The PED of a good is not the same for everyone → consumers of different income groups will have different price elasticity of demand for the same good.

Degree of Necessity

Type of Good	Example	PED	Reasoning
Necessities	Public transport, rice, medical services	PED <1	These goods cannot be forgone even if prices increase
Luxury goods	Rolex watches, Ferrari cars	PED >1	These goods can be forgone if prices increase
Addictive goods	Tobacco and alcohol	PED <1	Consumers may find it difficult to change their habits despite price increasing

Time Period under Consideration

- The longer the time period under consideration, the more price elastic the demand for the good.
- PED tends to be greater in the long run (more price elastic) than in the short run (more price inelastic) as consumers have more time to search for alternatives and adjust their habits and consumption in response to price changes.
- Example: Travelers who want to buy an air ticket for the next day's flight would be less sensitive to prices than someone buying an air ticket for a flight 9 months later, as there are more substitutes available over time.

Try it yourself: <u>Apple and Huawei's brand image</u> (Adapted from ACJC 2021 Prelim)

Apple has perfected the art of pushing up the price of its flagship phones, but without any significant impact on demand. However, the best thing for Apple is that, with this strategy, even a drop in volumes will ensure high revenue. Its success comes from its understanding that smartphones are the most essential commodity for a lot of its users. These customers will buy it at a higher price as they are convinced of the value it brings to them. In recent years, Apple has also developed a range of products – like Apple Arcade, Apple Music, AirPods, and the Apple Watch. The iPhone serves as a catalyst to lure people into its ecosystem and keep them hooked for whatever may be next.

Huawei's new flagship smartphone shows it has the technological know-how to compete with the best Apple and Samsung products on the market but to really take on the top two it needs to work on building its brand.

Source: Marketing Week, 17 October 2018 and Business Insider, 27 April 2020

Question

Ø

1) Explain how Apple is able to earn higher revenue despite pushing up the price of its smartphones.

5.3 <u>Price Elasticity of Demand and Change in Producer</u> <u>Revenue/Consumer Expenditure</u>

- Producer revenue is the total earnings (<u>Price × Quantity</u>) from the total output that the producer earns.
- Producer revenue is the same as consumer expenditure.
- Due to the law of demand, quantity demanded changes in the opposite direction, in response to a change in price of the good.
- Hence, for a given change in supply (shift of supply curve), whether TR will increase, remain the same or decrease depends on the relative magnitude of changes in P and Q which is in turn affected by the PED value of the good.

Diagrammatic analysis of changes in producer revenue given a rise in supply:

- Rise in supply \rightarrow rightward shift of the supply curve from SS₀ to SS₁ \rightarrow price of good X falls from P₁ to P₂ while quantity of good X rises from Q₁ to Q₂. How will producer revenue or consumer expenditure change?
- Depending on the price elasticity of demand, producer revenue or consumer expenditure can increase, decrease or remain the same.



SLS Lesson: "Price Elasticity of Demand"

Scenario 1: DD is price elastic: producer revenue (PR) increases



- When ↑SS, ↓P causes a more than proportionate ↑Q_{dd}
- ↑Q_{dd} by Q₁Q₂ ∴ PR↑ by CBQ₂Q₁ due to a greater quantity sold (given no change in price)
- ↓ P by P₁P₂ ∴ PR↓ by P₁ACP₂ due to selling at a lower price (given no change in quantity)
- **\uparrowPR** (due to \uparrow Q_{dd}) > \downarrow PR (due to \downarrow P)
- Outcome: \downarrow P leads to \uparrow PR



In summary, given a change in SS, the impact on producer revenue/ consumer expenditure is determined by the PED value of the good:

	Increase in SS → Decrease in price but increase in quantity	Decrease in SS \rightarrow Increase in price but decrease in quantity
If PED >1	Producer Revenue/Consumer Expenditure increases	Producer Revenue/Consumer Expenditure decreases
If PED <1	Producer Revenue/Total Consumer Expenditure decreases	Producer Revenue/Consumer Expenditure increases

Knowledge of PED is useful in helping firms to decide on their pricing decisions - whether increasing or decreasing prices would help them to increase producer revenue. With reference to the table above, if |PED|>1, firms should strive to decrease price (by increasing SS) to increase producer revenue. However, if |PED|<1, firms should increase price (by decreasing SS). In addition, knowledge of PED also helps firms to decide on the use of product innovation and/or other non-pricing strategies if required.

Scenario 2: DD is price inelastic: producer revenue (PR) decreases

5.4 Cross Elasticity of Demand (XED)

• Definition: It is a measure of the <u>degree of responsiveness of quantity</u> <u>demanded for one good to a change in the price of another good,</u> <u>ceteris paribus.</u>



• Formula:

Cross Price Elasticity of Demand (XED) for Good A (with respect to Good B)

 $\%\Delta$ in quantity demanded of Good A

 $\%\Delta$ in Price of Good B

• <u>Note:</u> In this definition, 'quantity demanded for Good A' is the variable affected, not demand, even though we learnt that the prices of other goods change demand (not quantity demanded) in the earlier learning package "Factors affecting Demand". This is because when it comes to measurement, it is difficult to measure the effect of changes in the prices of other goods on the whole demand curve. Instead, we just measure the effect of the change in Good B prices on the quantity demanded for Good A at the current price of Good A. Therefore, the cause-and-effect variables we are interested in for cross elasticity of demand are (i) the price of Good B (cause) and (ii) the quantity demanded for Good A (effect).



Exams Tips: Do not confuse XED with PED! If the start point is a change in the good's own price, PED should be used. If

Value of XED	Relationship	Interpretation of sign	Interpretation of magnitude	Examples
Positive Cross Price Elasticity (XED>0)	Substitutes	When price of good A decreases, → demand for good B decrease.	A value of +3 (positive elastic XED) reflects a situation of relatively close substitutes A value of +0.3 (positive inelastic XED) reflects poor substitutes between the two goods	Coffee from Starbucks and Coffee Bean may be considered close substitutes (cross elasticity of demand is positive and high). This is due to the comparability of their products and prices. On the other hand, the XED for Starbucks Coffee and coffee from coffee shops may be lower in magnitude, indicating the lower substitutability between these two products.
Negative Cross Price Elasticity (XED<0)	Complements	When price of good A decreases → demand for good B increases	A value of -3 (negative elastic XED) reflects a stronger complementary relationship between the two goods than a value of -0.3 (negative inelastic XED), which indicates the two goods are weak complements.	Demand for petrol is very closely related to demand for cars (cross elasticity of demand is negative and high). When the price of car decreases, demand for petrol increases because quantity demanded for cars increases, driving up the demand for complementary goods such as petrol. On the other hand, the XED for bread and butter may be negative but lower in magnitude as they are weaker complements.
XED=0	Unrelated	When price of good A changes, the demand for good B remains unchanged.	NIL	Changes in prices of watches are unlikely to affect the demand for hamburgers.
	<u>.</u>			·

5.5 Income Elasticity of Demand (YED)

- Definition: Measures the degree of responsiveness of quantity demanded for a good to a change in income (Y), ceteris ٠ paribus.
- Formula:

 $\%\Delta$ in quantity demanded of the good Income Elasticity of Demand (YED) = $\% \Lambda$ in Y

Note: In this definition, 'quantity demanded of the good' is the variable affected, not demand, even though we learnt ٠ that household income changes demand (not quantity demanded) in the earlier learning package "Factors affecting Demand". This is because when it comes to **measurement**, it is difficult to measure the effect of changes in household income on the whole demand curve.

Income Elasticity of Demand	Nature of good		Interpretation of sign	Interpretation of magnitude	Example
Positive Income elastic demand (YED>+1)	rive Income tic demand 70 (ED>+1) 9 Te		Income increases → increase in demand for the good	Income increases → more than proportionate increase in demand → Positive Income elastic	Income increases (10%) → demand for consumer durables (e.g. new laptops, furniture) increases more than proportionately → YED = +20 / +10 = +2
Positive Income inelastic demand (0 <yed<+1)< td=""><td>Norr</td><td>Necessity</td><td>Income increases → increase in demand for the good</td><td>Income increases → less than proportionate increase in demand → Positive Income inelastic</td><td>Income increases (10%) \rightarrow demand for rice increases less than proportionately \rightarrow YED = +5 / +10 = +0.5</td></yed<+1)<>	Norr	Necessity	Income increases → increase in demand for the good	Income increases → less than proportionate increase in demand → Positive Income inelastic	Income increases (10%) \rightarrow demand for rice increases less than proportionately \rightarrow YED = +5 / +10 = +0.5
Negative Income elasticity (YED<0)		Inferior	Income increases → decrease in demand for the good	Income increases → decrease in demand by the extent of the YED value of the good	Income increases (10%) → demand for imitation goods decreases → YED = -4 / +10 = -0.4



of Demand"

- Apart from the degree of necessity, the YED value of a good also depends on the existing income level of the consumer.
 - A Honda car can be a luxury good to an average income earner but an inferior good to a millionaire who fancies BMWs.
 - Therefore, luxury goods can be broadly understood as goods which are consumed in small amounts or not consumed at all before one's income increases, due to budget constraints.
 - The consumer's perception of the 'quality' of the good (e.g., branded goods) may also influence the responsiveness of his demand for the good to his income changes.

Key Learning Points in Section 5:

 $\checkmark\,$ Elasticity of demand measures the magnitude of change of demand of a good due to a change in its price, income and price of related good, ceteris paribus.

 \checkmark When supply changes, whether total revenue/consumer expenditure will increase or decrease, depends on the PED of the good.

After understanding the elasticities of demand, we now look into the concept of price elasticity of supply. This would help us to analyze the magnitude of change in quantity supplied when price changes, arising from a change in demand.

6. PRICE ELASTICITY OF SUPPLY

6.1 Price Elasticity of Supply (PES)

- Definition: It is a measure of the <u>degree of responsiveness of quantity</u> supplied to a change in the price of the good itself, ceteris paribus.
- PES explains the magnitude of the change in equilibrium price and quantity supplied arising from a given change in demand (represented by the demand curve shifting).
- Formula: Percentage change in quantity supplied divided by the percentage change in the price of the good itself.

Price Elasticity of Supply (PES) =
$$\frac{\%\Delta \text{ in } Qss}{\%\Delta \text{ in } Price}$$

Interpretation of sign: Due to the law of supply, PES is usually a positive value i.e. price and quantity supplied move in the same direction → a positive relationship.



SLS Lesson: "Price Elasticity of Supply"

Value of PES	Interpretation of magnitude	Example	Diagram
1 < PES < ∞	Supply is price elastic → a change in the price of the good itself brings about a more than proportionate change in quantity supplied, ceteris paribus.	A 10% increase in the price of good A (P_A) \rightarrow 20% increase in the quantity supplied of good A (Q_A).	Price of good A P_1 P_1 P_0 Q_0 Q_0 Q_1 Q_2 Q_1 Q_1 Q_1 Q_2 Q_1 Q_1 Q_2 Q_1 Q_2 Q_1 Q_2 Q_1 Q_2 Q_1 Q_2 Q_1 Q_2 Q_1 Q_2 Q_2 Q_1 Q_2
0 < PES < 1	Supply is price inelastic → a change in the price of the good itself brings about a less than proportionate change in quantity supplied, ceteris paribus.	A 10% increase in the price of good B (P _B) \rightarrow 5% increase in the quantity supplied of good B (Q _B).	Price of good B P ₁ P_1 P_0 $Q_0 Q_1$ DD_1 DD_1 Qty of good B

PES = ∞	Supply is perfectly price elastic \rightarrow quantity supplied at a given price will be infinite (actual quantity supplied will depend on its interaction with the demand curve).	Market supply only arises at a certain price, a slight change in price \rightarrow quantity supplied drops to zero.	Price of good C Figure 21: Market for good C $P_0 = P_1$ SS 0 Q_0 Q_1 Q_1 Q_1 Q_1 Q_1 Q_1 Q_2 Q_1 Q_2 Q_1 Q_2 Q_2 Q_1 Q_2 Q_2 Q_2 Q_1 Q_2
PES = 0	Supply is perfectly price inelastic → quantity supplied at any given price will be constant (regardless of the demand, the quantity supplied will remain unchanged).	A 10% increase in the price of good D (P _d) \rightarrow 0% increase in the quantity supplied of good D (Q _d).	Price of good D P_0 P_1 DD_2 DD_1 Qty of good D

Notes:

- Graphically, the more price elastic the supply, the gentler the slope of the supply curve. However, the slope of the supply curve is only a rough estimate of the PES value.
- The application of perfectly price elastic supply and perfectly price inelastic supply to the real-world context is limited. However, such extreme points of PES values serve as useful reference points for the purpose of comparison.

6.2 Factors Influencing Price Elasticity of Supply

Note that when discussing PES, we are usually talking about the industry/market supply as a whole and not individual supply. Therefore, the following factors refer to factors at an industry level.

Time taken to produce the good

- The shorter the production period \rightarrow the more price elastic the supply
 - Producers can increase their production quickly in response to the increase in price \rightarrow e.g. manufactured goods such as iPhones and electrical appliances.
 - Supply for primary products, which consists of agricultural products (such as rice and coffee) and raw materials (such as oil, timber and gold), is relatively more price inelastic due to longer production period.

Ease at which stocks can be stored (or perishability of the good)

- The longer the stocks (excess output) can be stored → the more price elastic the supply.
 - Supply of manufactured goods is more price elastic because goods may be kept until needed i.e. when price of the good increases, the producer is able to respond to it by increasing the quantity supplied by drawing down on his stocks.
 - Supply of perishable goods is relatively price inelastic because these goods cannot be stored for later use.

Availability of spare capacity

- The greater the spare capacity \rightarrow the greater the price elasticity of supply.
- Production at full capacity refers to maximum production where all factors of production are fully utilized
 - \circ When production level is at <u>full capacity</u> or there is no excess capacity, then PES = 0 (supply is perfectly price inelastic) since producers are not able to increase quantity supplied in response to price increases.

Availability of factors of production & factor mobility

- The more difficult the substitution of factors of production → the lower the price elasticity of supply.
 - E.g. shortage of labour in service-oriented industries such as restaurants and hotels make it difficult to increase quantity supplied as substituting machines for labour in such industries is not easy and efficient.
- Factor mobility is the ease at which factors of production can be transferred from the production of one good to another.

Time period under consideration

• The PES of good increases as the time period under consideration increases. Using a bakery as an example:



SLS Lesson: "Price Elasticity of Supply"

- In the immediate time period (this is also called the very short run) \rightarrow producers cannot increase their factors of production, hence supply is highly price inelastic (e.g. PES almost 0 \rightarrow cake stocks are limited to the amount available in the bakery).
 - In the short run → SS can be varied but is limited by existing fixed factors (ovens, kitchens, shop space, etc.). Producers may be able to increase the quantity of some of their factors such as labour, but not others such as the number of kitchens → PES < 1 (e.g. SS of cakes may be increased by working longer hours on the existing number of equipment).
 - o In the long run → fixed factors become variable and there is time for producers to acquire more factors and better technology → PES >1 (e.g. SS of cakes can be greatly increased by investing in better mixers and ovens, and renting more kitchens).

Number of producers in the industry

• The greater the number of producers in the industry → the more price elastic the supply is for the industry as the production and output can respond more readily to price changes.

Key Learning Points in Section 6:

 PES measures the degree of responsiveness of quantity supplied due to a change in price of the good itself, ceteris paribus.

Summary of Elasticity Values

Where *x* = elasticity value,



7. APPLICATION OF PRICE ELASTICITY OF DEMAND AND SUPPLY TO DETERMINE NEW EQUILIBRIUM PRICE AND QUANTITY

As we have learnt in previous sections, when demand or supply changes, the market experiences either a surplus or a shortage. Price adjustments help to eliminate the surpluses and shortages and bring the market to a new equilibrium point. As price increases or decreases, the quantity demanded and supplied change according to the law of demand and supply. Thus, PED and PES determine how much prices need to change in order to reach a new market equilibrium.

7.1 Price Elastic vs. Price Inelastic Demand when Supply Changes

- The following diagram illustrates the different magnitudes of price and quantity changes when there is a change in supply.
- Compare the impact on equilibrium price and quantity for rice and chicken nuggets when both markets experience an increase in supply from SS_0 to SS_1 :
 - Demand for rice is likely to be price <u>inelastic</u> while demand for chicken nuggets is <u>price elastic</u>.



Think about this!

Why does the PED for rice and chicken nuggets differ as predicted above? Consider the factors affecting PED.

Figure 23: Market for rice and chicken nuggets



- Impact on equilibrium price:
 - $\circ~$ An increase in supply from SS_0 to SS_1 leads to a surplus (Q_s > Q_D) in the market. This surplus causes a downward pressure on the price of both goods.
 - \circ As price falls, quantity demanded increases while quantity supplied falls until a new equilibrium is reached where $Q_D = Q_S$.
 - \circ <u>For rice</u>: since demand is price inelastic, a greater decrease in price is needed to increase quantity demanded and clear the surplus. Price of rice falls from P₀ to P₁.



SLS Lesson: "Application of PED and PES: Price and Quantity Determination"

- For nuggets: since demand is price elastic, a smaller decrease in price is needed to increase quantity demanded and clear the surplus. Price of nuggets falls from P_0 to P_2 .
- Thus the fall in price of rice is larger than the fall in price of nuggets.
- Impact on equilibrium quantity:
 - Quantity bought and sold in both markets will increase.
 - \circ Quantity of rice transacted increases from Q₀ to Q₁.
 - \circ Quantity of nuggets transacted increases from Q₀ to Q₂.
 - The increase in equilibrium quantity of nuggets is larger than the increase in equilibrium quantity of rice.
- The increase in quantity as a percentage of price decrease will be larger for chicken nuggets (price elastic demand) than for rice (price inelastic demand).
- In general:
 - $\circ~$ When demand is price elastic, an increase in supply from SS_0 to SS_1 will result in an increase in quantity that is proportionately more than the decrease in price, i.e. a larger percentage change
 - Whereas if demand were price inelastic, the change in quantity will be <u>proportionately less</u> (smaller percentage change) than the change in price, i.e. a smaller percentage change
 - This is because given the same magnitude of supply change, a price elastic demand will have a higher responsiveness of quantity demanded to price decreases, which allows the excess quantity supplied to be cleared through a smaller price fall, than if demand were price inelastic.

In summary, when supply increases,

Price <u>elastic</u> demand	Price <u>inelastic</u> demand
Price decreases from P_0 to P_2	Price decreases from P_0 to P_1
Quantity increases from Q_0 to Q_2	Quantity increases from Q_0 to Q_1
Increase in quantity <u>more</u> than proportionate to decrease in price	Increase in quantity <u>less</u> than proportionate to decrease in price
<u>Smaller</u> decrease in price needed to clear surplus	Larger decrease in price needed to clear surplus

Try it yourself:

The above explanation explains how PED determines the magnitude of price changes when there is a change in supply. Do you think PES also has an impact on extent of price changes?

7.2 Price Elastic vs. Price Inelastic Supply when Demand Changes

- The following diagram illustrates the different magnitudes of price and quantity changes when there is a change in demand.
- Compare the impact on equilibrium price and quantity for oil and digital camera when both markets experience an increase in demand from DD₀ to DD₁:
 - Supply for petrol is <u>price inelastic</u> while supply for digital camera is <u>price elastic</u>.







• Impact on equilibrium price:

- $\circ~$ An increase in demand from DD_0 to DD_1 leads to a shortage (Q_D>Q_S) in the market. This shortage causes an upward pressure on price of both goods.
- \circ As price increases, quantity demanded falls while quantity supplied increases until a new equilibrium is reached where $Q_D=Q_S$.
- \circ <u>For oil</u>: Since supply is price inelastic, a greater increase in price is needed to increase quantity supplied and clear the shortage. Price of oil increases from P₀ to P₁.
- For digital cameras, since supply is price elastic, a smaller increase in price is needed to increase quantity supplied and clear the shortage. Price of digital cameras increases from P_0 to P_2 .
- Thus, the increase in price of petrol is larger than the increase in price of digital cameras.
- Impact on equilibrium quantity:
 - Quantity bought and sold in both markets will increase.
 - Quantity of petrol increases from Q0 to Q1.
 - Quantity of digital camera increases from Q0 to Q2.
 - The increase in quantity of digital cameras is larger than the increase in quantity of petrol.
- The increase in quantity as a percentage of price increase will be larger for digital camera (price elastic supply) than for petrol (price inelastic supply).

In general:

- When supply is price elastic, an increase in demand from DD₀ to DD₁ will result in an increase in quantity that is **proportionately more** than the increase in price, i.e. a larger percentage change
- Whereas if supply were price inelastic, the change in quantity will be **proportionately less** (smaller percentage change) than the change in price, i.e. a smaller percentage change
- This is because given the same magnitude of demand change, a price elastic supply will have a higher responsiveness of quantity supplied to price increases, which allows the excess quantity demanded to be cleared through a smaller price increase, than if supply were price inelastic.

In summary, when demand increases,

Price <u>elastic</u> supply	Price <u>inelastic</u> supply
Price increases from P_0 to P_2	Price increases from P_0 to P_1
Quantity increases from Q_0 to Q_2	Quantity increases from Q_{0} to Q_{1}
Increase in quantity more than proportionate to increase in price	Increase in quantity less than proportionate to increase in price
Smaller increase in price needed to clear shortage	Larger increase in price needed to clear shortage



Try it yourself:

The above explanation explains how PES determines the magnitude of price changes when there is a change in demand. Do you think PED also has an impact on extent of price changes?

Key Learning Points in Section 7:

- ✓ When demand or supply changes, the resulting magnitude of change in price and quantity is dependent on the price elasticity of demand and the price elasticity of supply.
- \checkmark The more price inelastic the demand and supply, the more volatile the prices of the good will tend to be (and vice versa).

Next, we will look at how producers are guided by elasticity concepts in their decision-making processes.

8. RELEVANCE OF ELASTICITY CONCEPTS TO PRODUCERS IN RAISING PRODUCER REVENUE

Elasticity concepts are important in producers' pricing and output decisions (or strategies) because they will impact a producer's producer revenue.

8.1 <u>Relevance of Price Elasticity of Demand for Producers</u>

Referring to Courts' promotional sale (Pg 28), how does the concept of PED help to increase revenue for producers?

- Total Expenditure = Total Revenue = Price x Quantity (consumers) (producers) (bought or sold)
- A price reduction (via an increase in supply) would only increase total revenue if the demand for the good is price elastic.



Figure 25

- When DD is price elastic, and SS^, $\downarrow P$ causes a more than proportionate $\uparrow Q_{dd}$
- $\uparrow Q_{dd}$ by $Q_1Q_2 \therefore TR\uparrow$ by CBQ_2Q_1 due to selling a higher quantity
- \downarrow P by P₁P₂ \therefore TR \downarrow by P₁ACP₂ due to selling at a lower price
- \uparrow TR (due to \uparrow Q_{dd}) > \downarrow TR (due to \downarrow P)
- Outcome: \downarrow P leads to \uparrow TR
- In contrast, a price reduction would reduce total revenue if demand is price inelastic (try drawing and analysing it on your own).

In summary,

- If the producer deems the demand for its product to be price inelastic, he should increase prices (by reducing supply) to earn higher total revenue. Consumers would still buy the product as there may be a lack of strong substitutes or it is a necessity.
- If the producer deems the demand for its product to be price elastic, he should reduce prices (by increasing supply) to earn higher total revenue.



Think about this!

Are there any constraint or unintended consequences the producer may face when adopting such pricing strategy?

8.2 <u>Relevance of Cross Elasticity of Demand for Producers</u>

Knowledge of XED is useful to producers in their business decisionmaking (pricing and non-pricing decisions) as it provides information on the extent of effects on their products' demand when faced with a change in the price of the competitor's products or complementary products.

<u>Scenario:</u> Suppose you are the CEO of SingTel, how might the concept of XED be useful to you?

- There are strong rivals such as Starhub and M1 \rightarrow high positive value of XED
- A price reduction by any of them → more than proportionate decrease in quantity demanded of SingTel's services → TR falls
- Therefore, SingTel has to **price its services competitively (i.e., reduce prices)** in order not to suffer massive losses.
- SingTel should also reduce the value of the XED through **product and service differentiation** so that its revenue would not be adversely affected when its competitors lower their prices.
- There are also complementary products such as smartphone which SingTel mobile services has a high negative value of cross price elasticity of demand with.
- SingTel can collaborate with firms producing complementary products so that it can tap on the consumer base of these firms to raise its sales revenue. Example: Singtel offering discount on Samsung smartphones when customers renew their contracts.

8.3 <u>Relevance of Income Elasticity of Demand for Producers</u>

If household income is changing or expected to change in the near future, the knowledge of YED can help a producer to make decisions on:

- which product to stock up/produce
- where to locate their business
- whether to increase or decrease their scale of production (e.g., number of retail outlets)

<u>Scenario:</u> Suppose you are the CEO of Apple, how might the concept of YED be useful to you?

- IPhones and IPads could be considered as luxury goods \rightarrow high YED value
- When income is rising \rightarrow more than proportionate increase in demand for Apple's product \rightarrow increase in total revenue
- Therefore, Apple should market their products in countries where income is rising
- Apple has also come up with a more inferior version of the IPhone (IPhone SE) in view of weak economic growth in some countries → Consumers may switch to more inferior products as incomes fall (e.g. Huawei phones)

8.4 Relevance of Price Elasticity of Supply for Producers

<u>Scenario:</u> Suppose you are a rice farmer, how might the concept of PES be useful to you?

- Supply for rice is highly price inelastic due to the long production period → unable to respond quickly when price increases as a result of increased demand → losing market share to its competitors.
- Farmers can take steps to increase the PES value to take advantage of the price increase → investing in machinery to improve yield, acquiring more plots of land etc.
- This is referred to as "forward planning".
- Example: With the expected growth in demand for air travel in the Asia-Pacific region, low-cost carrier Tiger Airways has placed an order for eight more Airbus A320s in Dec 2012.

8.5 Limitations of Elasticity Concepts to Producers

While the use of the elasticity concepts is helpful to various groups in society in pursuing their respective objectives, their usefulness is constrained by a variety of factors.

- a) The "ceteris paribus" assumption may not hold
- Any application of elasticity concept must operate under the "ceteris paribus" assumption. In the real world, more than one factor affecting demand or supply can change simultaneously.
- b) Data collected may not be accurate or reliable
- The data collected may not be accurate due to reasons like small and unrepresentative sampling size or interviewers may not reveal their preferences truthfully due to personal reasons.
- The data may also be unreliable if there is a lengthy time lag between the collation of data and the implementation of strategy by the producer.
- c) Costs of production are unlikely to remain constant
- One common application of elasticity concepts is to help producers to predict changes to its total revenue with the aim of maximizing profits. Such an approach, however, assumes that costs of production

are constant so that the effect of price changes on revenue can then be extended to profits as well. This is unlikely to be so.

Key Learning Points in Section 8:

- \checkmark Elasticity concepts can be used to guide producers' decisions.
- ✓ There are limitations involved in the use of elasticity concepts in decision-making by producers and governments.

9. GOVERNMENT INTERVENTION IN COMPETITIVE MARKETS

- Generally, governments intervene in the market when it deems the allocation of resources to be either inefficient or inequitable.
- There are several ways in which governments can intervene in the competitive markets e.g., indirect taxes, subsidies and government regulations. All of them interfere with the free functioning of the price mechanism.

9.1 Why governments intervene in markets

	Reason	Examples
1.	To raise government revenue	The GST is imposed on all goods and services solely to raise government tax revenue. An increase in GST from 7% to 9% will increase prices of all goods and services in the economy. Other forms of taxes are also government's sources of revenue, but their main purpose is for other reasons.
2.	To encourage, discourage or even prohibit the production or consumption of a good	 Water tariff - to encourage households to save water by increasing the price of water usage Government subsidies on public transport - to encourage people to take public transport by making bus and MRT fares low. This will reduce traffic congestion and air pollution Government ban on sale of chewing gum -to reduce the consumption of chewing gum to zero
3.	To ensure certain goods are affordable especially for the lower income, to achieve income equity	Government subsidies of up to 80% for hospitalisation and outpatient treatments for lower income to ensure healthcare services are affordable for them

Governments intervene in the market for various reasons.



SLS Lesson: "Government Intervention: Indirect Taxes and Subsidies"

4.	To stabilise prices	Governments may control prices of rice to protect the revenue of farmers in countries with a large agricultural sector.
5.	To redistribute incomes	Higher taxes may be imposed on higher income households, while subsidies are given to low income households for essentials such as education.

9.2 Indirect Tax

- Indirect tax is a tax imposed on the production of goods and services, which are then passed on to consumers in the form of higher prices.
- Tax may be as a percentage of price (known as ad valorem tax, e.g., GST in Singapore) or a fixed amount per unit (known as specific tax).
- When tax is levied on the good, producers will pay the amount of tax to the government first, causing them to cut their production, hence reducing supply (supply curve to the left) thereby increasing the price of the good.



- Initially, market equilibrium is at E₀, Price = P₀, Quantity = Q₀
 Producer Revenue/Consumer Expenditure = P₀ x Q₀
 Consumer surplus = Area AE₀P₀
 Producer surplus = Area P₀E₀B
- A specific tax t imposed on alcohol → at all quantities, the price firms are willing and able to sell the good for is higher by the amount of the unit tax so that firms will effectively receive the same price after paying the taxes to the government. This is represented by an upwards / leftward shift of supply curve from SS₀ to SS_t
- After tax, at the new equilibrium E₁, Price = P₁, Quantity = Q₁



SLS Lesson: "Government Intervention: Indirect Taxes and Subsidies"

Impact on government tax revenue:

- The government collects the tax per unit, t, multiplied by the number of units sold, Q_1 .
- Thus the tax revenue collected = Area P_1E_1CT
- Note that if demand is more price inelastic, the increase in price leads to a smaller decrease in quantity, thus more tax revenue can be collected. (You should try re-drawing figure 26 with a steeper demand curve to illustrate this.)

Impact on consumer expenditure:

- \circ Consumers now pay a price of P₁ per unit of good.
- \circ Thus the total consumer expenditure is P₁ x Q₁
- Since price has increased and quantity has fallen, whether consumer expenditure increases or decreases depends on the relative changes in P and Q, and thus the PED of the good.
- For example, if demand is price **inelastic** (e.g. cigarettes), the increase in price leads to a **less** than proportionate decrease in quantity demanded, and total consumer expenditure will **increase**.

Impact on producer revenue:

- After paying the tax to the government, the producer only collects $P_1 t = T$ per unit sold.
- Thus producers now receive a lower price of T for each unit sold.
- o The total **post-tax** revenue earned falls to T x Q_1
- Since both price received and quantity sold has fallen, post-tax revenue will **always fall** as a result of an indirect tax.

Impact on consumer surplus:

- \circ Consumers now pay a higher price for a lower quantity of the good.
- \circ There is a loss in consumer surplus of area $P_1E_1E_0P_0$
- $_{\odot}$ $\,$ The new consumer surplus is represented by area $AE_{1}P_{1}$

Impact on producer surplus

- Producers now receive a lower price at a lower quantity sold.
- \circ There is a loss in producer surplus of area P₀E₀CT
- The new producer surplus is represented by area TCB
- Notice that part of the losses in consumers' and producers' surpluses goes to the government in terms of government tax revenue.
- Area E₁E₀C which is lost in terms of consumers' and producers' surpluses and not gained by anyone in the society is termed as deadweight loss to the society.

9.3 Subsidy

• Subsidies are paid by governments to producers/consumers on goods and services to encourage production and consumption.



- Initially, market equilibrium at E₀, Price = P₀, Quantity = Q₀
 Producer Revenue/Consumer Expenditure = P₀ X Q₀
 Consumer surplus = area AE₀P₀
 Producer surplus = area P₀E₀B
- A subsidy s is given on the production of the good → at all quantities, the price firms are willing and able to sell the good for is lowered by the amount of the unit subsidy since firms will effectively receive the same price after getting the subsidies from the government. → This is represented by a downward / rightward shift in the supply curve from SS0 to SS1
- After subsidy, at the new equilibrium at E,

Price = P_1 , Quantity = Q_1

Impact on government expenditure:

- The government spends the subsidy per unit, s, multiplied by the number of units sold, Q_1 .
- \circ Thus, the total amount subsidised by the gov = Area P₁E₁FG
- Note that if demand is more price inelastic, the government would have to subsidise a larger amount to get the same increase in quantity. (You should try re-drawing figure 27 with a steeper demand curve to illustrate this.)

Impact on consumer expenditure:

- \circ Consumers now pay a subsidised price of P₁ per unit of good.
- \circ Thus the total consumer expenditure is now P₁ x Q₁
- Since price paid has fallen and quantity bought has increased, whether total consumer expenditure increases or decreases depends on the relative changes in P and Q, and thus the PED of the good.

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• For example, if demand is price **inelastic** (e.g. education), the decrease in price leads to a **less** than proportionate increase in quantity demanded, and total consumer expenditure will **decrease**.

Impact on producer revenue:

- After the subsidy, producers now receive a higher price of $P_1 + s = F$ per unit sold.
- \circ The total revenue received by producers is now F x Q₁.
- Since both price received and quantity sold has increased, the producer's revenue will **always increase** as a result of a subsidy.

Impact on consumer surplus:

- Consumers now pay a lower price for a higher quantity of the good.
- \circ $\;$ There is an increase in consumer surplus of area $P_1E_1E_0P_1$
- \circ $\;$ The new consumer surplus is represented by area AE_1P_1

Impact on producer surplus:

- Producers now receive a higher price at a higher quantity sold.
- \circ There is an increase in producer surplus of area $P_0 E_0 GF$
- The new producer surplus is represented by area FGB
- Notice that part of the government's total expenditure is gained by consumers and producers through the increase in consumer and producer surpluses.
- Area E₀GE₁ which is incurred by the government is not gained by anyone in society and is therefore a **deadweight loss** to society.

9.4 Price Controls - Maximum & Minimum Prices

- The government may intervene in the market to fix prices at a disequilibrium level in order to increase society's welfare.
- This could be due to considerations such as equity taking precedence over efficiency in certain markets or during certain time periods.
- However, this will cause markets to be in persistent shortages or surpluses, i.e., disequilibrium.

9.4.1 Maximum Price (Price Ceiling)

- Price ceiling refers to the maximum price that producers can legally charge.
- Price ceiling may be established by the passing of a law which then makes it becomes illegal for producers to sell the good above the prescribed price.

Objectives/Reasons for Price Ceiling

- 1. To prevent overcharging by producers (e.g. rentals of houses and apartments), i.e. to protect the welfare of consumers
- 2. To ensure affordability of essential goods, especially during times of high prices or shortage of necessities



Price Controls"



- Initially, market equilibrium at E₀, Price = P₀, Quantity = Q₀ Producer Revenue/Consumer Expenditure = P₀ X Q₀
- The government deems the equilibrium price to be too high and thus sets the price ceiling at P₁, which is lower than P₀.
 - $\circ~$ Quantity demanded increases to Q_2 while quantity supplied decreases to Q_1
 - $\circ~$ Market thus experiences a disequilibrium situation (shortage) $\rightarrow~$ quantity demanded at Q_2 > quantity supplied at Q_1 at the new maximum price P_1

	Original market	After maximum	Change
Consumer Surplus	Area AE ₀ P ₀	Area AE ₁ CP ₁	+ Area P ₀ P ₁ CF - Area E ₁ FE ₀ (Overall net gain/loss depends on the relative size of these two areas. Consider how PED/PES is relevant here.)
Producer Surplus	Area P ₀ E ₀ B	Area P1CB	Decrease/Loss by Area P ₀ E ₀ CP ₁
Deadweight Loss	Nil	Area E_1E_0C	Society incurs a deadweight loss

Welfare Impacts of Price Ceiling

Negative Consequences of Price Ceiling

- Society incurs a deadweight loss given that an equilibrium condition is not established after the price floor policy has been imposed.
- A situation of shortage Q_sQ_d arises at $P_1 \rightarrow$ some consumers would not be able to obtain the good \rightarrow a **black market** may result due to the following reasons:

- $\circ~$ There are consumers who are willing to pay higher prices than P_1 for the limited amounts of the good.
- \circ For example, in the diagram below, at limited quantity of Q_s, consumers are willing and able to pay up to P_b.
- \circ Producers wanting to maximize their profits will want to sell their goods at a higher price of P_b since they will be able to earn additional revenue (indicated by the shaded area).
- There is thus a motivation for producers to sell some of their goods illegally in a black market to those buyers who are willing to pay above the price ceiling level.

The figure below illustrates the case in which **all the available supply** is sold on a black market. Very often in reality, only a portion of the goods are available in the black market.



To ensure that the policy of a price ceiling achieves its objectives, the government will have to monitor the market closely to prevent the development of a black market.

9.4.2 Minimum Price (Price Floor)

- A price floor is the minimum price that the sellers can legally sell their good at.
- Price floor may be established by the passing of a law which then makes it becomes illegal for producers to sell the good below the prescribed price

Objectives/Reasons for Price Floor Policy

- 1. To protect producers' incomes
 - If the industry is subject to supply fluctuations (e.g. fluctuations in weather affecting crops) → prices are likely to fluctuate severely → Minimum prices will prevent the fall in producers' incomes (total revenue earned) that would usually accompany periods of low prices.
 - Minimum wage legislation is passed to protect certain groups of workers whose wages might be too low to ensure a minimally adequate standard of living.
- 2. In the case of undesirable goods, a price floor decreases the quantity demanded of the good, as it becomes more expensive.



SLS Lesson: "Government Intervention: Price Controls"





- Initially, market equilibrium is at E₀, Price = P₀, Quantity = Q₀ Producer Revenue/Consumer Expenditure = P₀ X Q₀
- Government deems the original equilibrium price P_0 as too low and sets a minimum price (wage) at P_1 which is higher than P_0 .
 - \circ The increase in price (wage) causes a decrease in quantity demanded to Q_1 as firms are less willing to hire workers at the higher wage.
 - \circ Although quantity supplied has increased to Q_2 since more workers are willing and able to work at the higher wage, only Q_1 workers will be employed.
 - $\circ~$ Market thus experiences a disequilibrium situation (surplus) $\rightarrow~$ quantity supplied at Q_2 > quantity demanded at Q_1 at the new minimum price P_1
 - A surplus of workers in the labour market represents unemployment as there are workers willing and able to work, but are unable to find a job.

	Original market	After minimum	Change
	equilibrium	price policy	
Consumer	Area AE ₀ P ₀	Area AE_1P_1	Decrease/Loss by Area
Surplus			PE ₁ E ₀ P ₀
Producer	Area P ₀ E ₀ B	Area P ₁ E ₁ CB	+ Area P ₁ P ₀ FE ₁ - Area FE ₀ C
Surplus			(Overall net gain/loss
			depends on the relative
			size of these two areas.
			Consider how PED/PES is
			relevant here.)
Deadweight	Nil	Area E1E0C	Society incurs a
Loss			deadweight loss

Welfare Impacts of Price Floor Policy:

Negative Consequences of Price Floor

- Society incurs a deadweight loss given that an equilibrium condition is not established after the price floor policy has been imposed.
- Price floor may also lead to inefficiency among producers.
 - Producers may feel less of a need to find more efficient methods of production to cut their costs, as their profits are protected by the high price
 - The high price may also discourage producers from producing alternative goods which they could produce more efficiently
- Applying to the labour market, people employed (OQ_d workers) will have guaranteed higher wage rate while Q_dQ_s will be unemployed.
- In the market for agricultural products, a price floor will result in a surplus which is usually bought up by the government.
 - To deal with the surpluses, the government will have to store it, destroy it or sell it overseas.
 - Price floor inevitably involves government funding, thus incurring opportunity costs in terms of lesser spending in other areas like education or healthcare or housing.

9.5 <u>Quantity Control - Quota</u>

The government may decide to control the market quantity of a particular product instead of its price.

- A quota is the highest possible quantity that could be exchanged in the market set by the government.
- To be effective, the quota must be set below the market equilibrium quantity.
- An example of this is the Certificate of Entitlement (COE) system used to control car ownership in Singapore.
- Anyone who wishes to register a new vehicle in Singapore must first obtain a COE → A COE represents the right to vehicle ownership and use of the limited road space for 10 years.
- The number of COEs available each month is fixed by the government
 → limiting the number of cars that can be bought.



SLS Lesson: "Government Intervention: Quantity Control"



- Initially, market equilibrium is at E₀, Price = P₀, Quantity = Q₀
 Producer Revenue/Consumer Expenditure = P₀ X Q₀
- The government deems the original equilibrium quantity to be too high and thus sets the desired quantity of Q_1 which is lower than the original equilibrium quantity.
- Note that the new supply curve is now BCSSQuota
- After quota, new equilibrium at E, Price = P1, Quantity = Q1

•	•		
	Original market	After quota	Change
	equilibrium	policy	
Consumer	Area AE ₀ P ₀	Area AE ₁ P ₁	Decrease/Loss
Surplus			
Producer	Area P ₀ E ₀ B	Area P ₁ E ₁ CB	+ Area P ₁ P ₀ FE ₁ - Area FE ₀ C
Surplus			(overall net gain/loss
			depends on the relative
			size of these two areas)
Deadweight	Nil	Area E ₁ E ₀ C	Society incurs a
Loss			deadweight loss

Welfare Impacts of Quota Policy:

Negative Consequences of Quota

- Society incurs a deadweight loss.
- Limiting the quantity within a market will inevitably hike up the price of the controlled good, causing consumers who are otherwise able to afford the good to be deprived of it.
- Meanwhile, producers cannot expand their production and reap cost savings because of the lower output produced.
- Due to the high price, producers' profits are protected and they may lose the incentive to remain competitive.

Key Learning Point in Section 9:

 ✓ Government may impose price or quantity controls to improve efficiency or equity.

10. APPLICATION TO REAL WORLD MARKETS

The application of price mechanism is not limited to consumer goods such as bicycles and clothing. The price mechanism can also be used to determine the equilibrium price and quantity of currencies and factors of production.

10.1 Application of Price Mechanism to Factor Markets

- Factor markets are where the factors of production (i.e. Capital, Entrepreneurship, Labor, Land) are bought and sold.
- Factors of production also have a price determined by the price mechanism in the factor market.

THE MARKET FOR LABOUR

- The price of labour is the **wage** or salary that has to be paid to the factor owners, i.e. individuals.
- Demand-supply analysis can be used to understand wage differentials across jobs.

Table: Average salary for a variety of occupations in Singapore

Industry	Job Title	Median Gross Wage
Art, Entertainment, Recreation and Other Services	General office clerk	\$2288
Financial Services	Manger	\$9410
Financial Services	Finance and insurance clerk	\$ 2725
IT & Other Information Services	Software, web and multimedia developer	\$5535
Education, Health and Social Services	Cleaner in offices and other establishments	\$ 1274
Education, Health and Social Services	Pre-primary education teacher	\$ 2450

Source: Occupational Wages, Ministry of Manpower Statistics & Publications 2017

Determination of equilibrium wage rate in the labour market



- As seen in figure 1, the equilibrium number of workers for the labour market is Le and the equilibrium wage is We, as determined by the interaction of the demand and supply for labour.
- Similar to the product market, any change in the demand and/or supply will disturb the equilibrium and lead to a new equilibrium.

Factors affecting demand for workers

- Demand for final product
 - The demand for labour is a derived demand: demand for pharmaceutical products increases → demand for pharmaceutical industry workers increases in order to increase production
- Changes in prices of related factor input
 - Price of machinery falls → demand for workers falls if producers substitute labour with capital in their production process
- Changes in productivity of workers
 - Productivity of workers increases → more cost efficient → demand for workers increases

Factors affecting supply for workers

- Demographics of population
 - Ageing population \rightarrow number of people willing and able to work fall \rightarrow supply of labour falls
- Government policies
 - $\circ~$ Increase in retirement age / immigration \rightarrow supply of labour increases

10.2 Application of Price Mechanism to the Foreign Exchange Market

- Currencies are bought and sold at the foreign exchange market
- The exchange rate is the price at which on currency is traded for another

How is the exchange rate determined?

Demand and supply conditions in the foreign exchange market determines the exchange rate between two currencies. The **foreign exchange market refers to the buying and selling of currencies.** This market operates just like other markets but the foreign exchange market can be volatile because the demand and supply forces are sensitive to economic and political conditions in countries.

The exchange rate for SGD (the price of SGD) in terms of MYR for example depends on the

- **Demand for SGD:** From individuals and producers buying SGD (selling MYR), to buy Singapore-produced goods and services or to invest in Singapore.
- Supply of SGD: From individuals and producers selling SGD, (buying MYR), to buy Malaysia-produced goods and services or to invest in Malaysia.



Key terms used in describing the changes in the exchange rate market:

- Equilibrium exchange rate: The level of exchange rate at which demand is equal to supply. It is the point which an exchange rate will move towards, depending on whether the market is in shortage (Qd>Qs) or surplus (Qs>Qd) condition.
- Appreciation: When a currency's exchange rate rises (an increase in price).
- **Depreciation**: When a currency's exchange rate falls (a decrease in price).

The two figures below would help you to understand how appreciation of a currency takes place:

Figure 1a: Demand for SGD increases







The above diagrams show that SGD can appreciate when

- DD rises OR
- SS falls OR
- Both changes taking place concurrently (more likely scenario in the real world).

Note: E_0 is original equilibrium exchange rate. E_1 is the new equilibrium exchange rate that the currency will appreciate towards arising from the increased demand or decreased supply in the foreign exchange market.

A depreciation (a weakening of the exchange rate), happens if DD for a currency falls OR SS of a currency rises OR both taking place concurrently.

Learning Reflection

Congratulations! You have completed the topic of Price Mechanism & its Applications. How much have you understood?

Below are the checklists which you may use to assess how much you have understood.

	Content Checklist: Are you able to do the following?	
1.	Define demand and supply	
2.	State the law of demand and supply	
3.	Explain how demand and supply will be affected by the following:Change in the price of the goodChange in other factors	
4.	With the aid of a diagram, explain how market equilibrium is established	
5.	With the aid of a diagram, explain how market moves towards a new equilibrium when demand and/or supply conditions changes	
6.	With the aid of diagrams, explain the concepts of consumer and producer surplus	
7.	Explain the role of price mechanism in resource allocation	
8.	Define PED, YED, XED and PES	
9.	Explain the significance of the sign and magnitude for PED, YED, XED and PES	
10.	Explain the factors affecting the value of PED, YED, XED and PES	
11.	Explain the effects of change in supply on total revenue/consumer expenditure using the concept of PED	
12.	Explain how PED, YED, XED and PES can be of use to producers	
13.	Evaluate the usefulness of PED, YED, XED and PES to producers	
14.	Explain how governments can use taxes, subsidies, price ceilings and price floors to intervene in markets.	
15.	With the aid of diagrams, explain ow government intervention can affect the equilibrium price, equilibrium quantity, producer revenue and consumer expenditure of a good, and how these variables may be affected by the price elasticities of demand and supply of the good.	