Topic 4: Government Intervention and the Labour Market

Theme 2.1: Price Mechanism and its Applications

How to use this set of lecture notes?

1) **BEFORE LECTURES – UNDERSTANDING CONTENT**
   - Reference your notes against your H2 syllabus. Mark out the key concepts so that you know what you MUST know
   - Read your notes ahead so that you can focus on listening and capturing additional notes during lectures

2) **During lectures – APPLYING CONTENT**
   - Bring your hard copy notes along, and use your PLDs to refer to the lecture slides concurrently
   - Capture additional notes, especially the real world examples where you can note down how concepts are applied and how economic analysis are developed in varying contexts
   - You should make use of a notetaking/consolidation tool to take notes during lessons and to consolidate your learning at timely junctures. Examples are MIRO, Notion, Good Notes, Notability, Microsoft OneNote, KAMI, and etc. The choice is yours!

3) **After Lectures – TUTORIAL PREPARATION to use content flexibly to show application, analysis and evaluation skills**
   - Revise concepts relevant for the case study and essay questions
   - Refer to the notes and use it flexibly to prepare your answers to meet question requirements. Pure memorisation will not work as it does not involve deep understanding.
   - Do share your notes with your friends to multiply learning!

CONTENTS

1. Introduction to Economic Welfare

The central economic problem concerns the allocation of scarce resources among competing uses to satisfy unlimited human wants for goods. Hence, our decision-making on how to allocate these scarce resources to meet our unlimited wants is crucial. Thus far, we claim that the **price mechanism** is efficient in allocating those resources in the **free market**. Specifically, we will consider how the price mechanism is able to **achieve *allocative efficiency***, where society produces the optimal/right mix of goods and services that **maximises social welfare**. This means that the **sum of consumer and producer surpluses is at its maximum.**

In this topic, we will explore the analysis of societal welfare by considering how consumer and producer surpluses are derived.

1.1. Consumer surplus

Consumer surplus is the **difference between the maximum amount that a consumer is willing and able** to pay for a good and the **amount that he actually paid** for the good.

This is a measurement of consumers' welfare. As mentioned earlier, each and every point on the demand curve represents the maximum price that consumers are willing and able to pay for the good.

a. Tabular representation

Consider this individual demand schedule:

Price ($)	14	10	6	4
Quantity demanded	1	2	3	4

Assuming the equilibrium price in the market for the good is $4, then the individual consumer surplus will be:

Quantity demanded	Maximum price that consumer is willing to pay ($)	Equilibrium price ($)	Consumer surplus ($)
1	14	4	10
2	10	4	6
3	6	4	2
4	4	4	0

Graphical representation

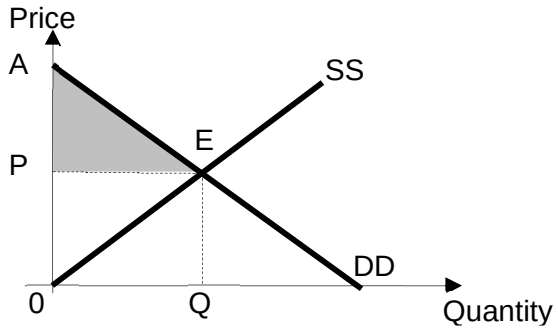


Figure 1: Consumer Surplus

The vertical distance between the demand curve and the price line is the consumer surplus for that unit the consumer buys. It represents the net benefit he receives for the good he buys. Hence, the **area of the shaded triangle PAE bounded above the price line and the demand curve** in Figure 1 represents the **consumer surplus** at the market equilibrium price.

1.2. Producer surplus

Producer surplus is the **difference between the amount that a producer of a good actually receives** and the **minimum amount that the producer is willing and able** to sell the good.

This is a measurement of producers' welfare. Recall that the supply curve represents the minimum price that the producer is willing and able to sell the good.

a. Tabular representation

Consider this individual supply schedule:

Price ($)	1	4	8	12
Quantity supplied	0	1	2	3

Assuming the equilibrium price is $12, the individual producer surplus is:

Quantity supplied	Minimum Price that producer is willing to sell ($)	Equilibrium price ($)	Producer surplus ($)
1	4	12	8
2	8	12	4
3	12	12	0

b. Graphical representation

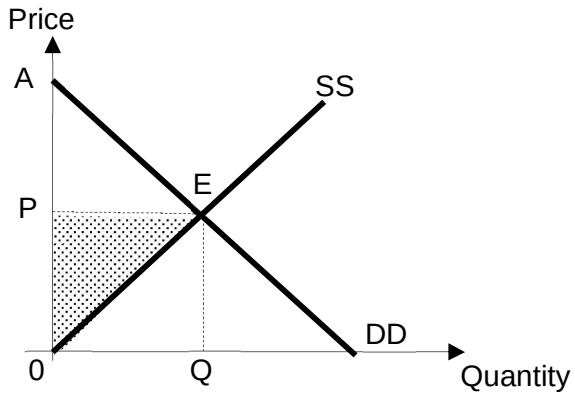


Figure 2: Producer Surplus

The vertical distance between the supply curve and the price line is the producer surplus for the unit that the producer sells. It represents the net benefit he receives for the good he sells. Hence, the **area of the shaded triangle 0PE bounded below the price line and the supply curve** represents the **producer surplus** at the market equilibrium price in Figure 2.

1.3. Society's welfare

As illustrated in Figure 3, the market equilibrium is the point where the **sum of consumer and producer surplus is the largest** i.e., **society's welfare is being maximised**.

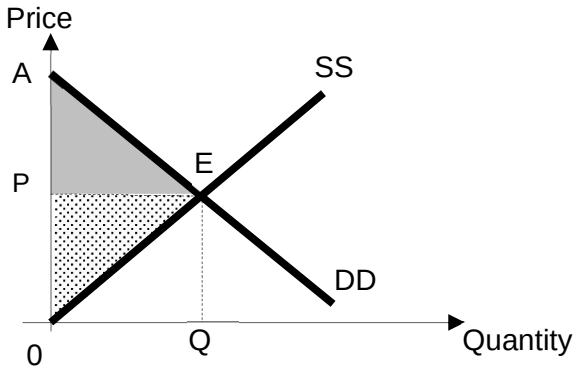


Figure 3: Society's welfare maximised at market equilibrium

Figures 4a and 4b shows what happens when a market is in disequilibrium – when prices are higher or lower than the equilibrium price. In Figure 4a, the price set at P_0 is higher than the equilibrium price. At this price, a surplus is created because the quantity supplied Q_s is more than the quantity demanded Q_d. The surplus of Q_dQ_s will not be traded as there are insufficient buyers, so only Q_d is bought and sold at price P_0. The consumer surplus for this quantity traded is AP_0C while the producer surplus is BP_0CD. Thus, the society's welfare is area ABCD.

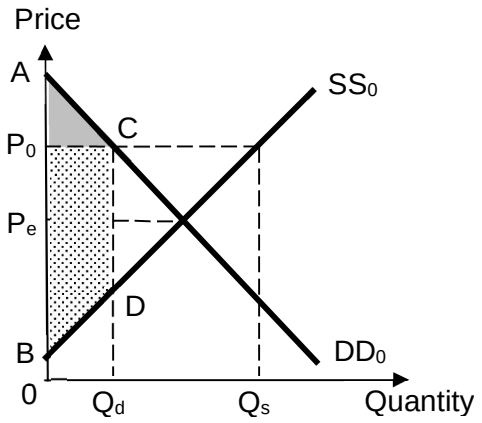


Figure 4a: Society's welfare when $P_0>P_e$

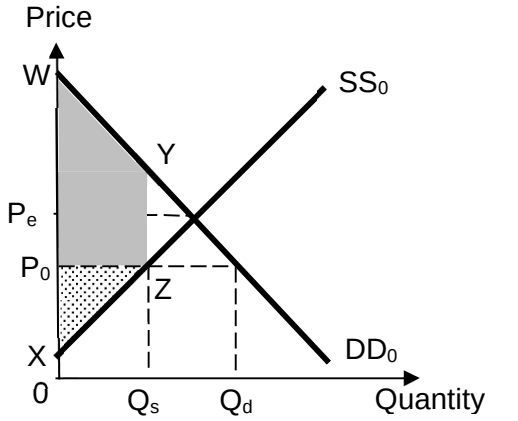


Figure 4b: Society's welfare when $P_0<P_e$

In Figure 4b, the price set at P_0 is lower than the equilibrium price P_e. At this price, a shortage is created because the quantity demanded Q_d is more than the quantity supplied Q_s. Only Q_s is bought and sold at price P_0 since there are insufficient goods offered for sale. The consumer surplus is P_0WYZ while the producer surplus is P_0ZX. Thus, the society's welfare is area WXZY.

In both cases of disequilibrium, the quantity traded is lower than the equilibrium quantity. Increasing the quantity traded would improve society's welfare. At the equilibrium quantity, the society's welfare would be maximised. **Hence, we can conclude that the free market is efficient in allocating resources, such that the resultant equilibrium will maximise society's welfare.** Therefore, the free market could be viewed as always leading to a desirable outcome.

NOTE: These market disequilibrium(s) will be further analysed under Section 2 Government Intervention in the Free Market because at times, government policies can cause the market to be in a disequilibrium and thus can create some negative unintended consequences on some economic players while benefitting others.

2. Introduction to Government Intervention in the Free Market

Thus far, we have examined how the free market is efficient in allocating scarce resources to meet unlimited wants. However, in the real world, the outcomes of allocation may not be socially desirable, i.e., the equilibrium price and quantity may be too high or too low. In such cases, the free-market outcomes are deemed to be undesirable by the government. The government therefore intervenes in the market to alter the behaviour of consumers and producers, and thereby achieve its intended consequences of efficiency and/or equity. However, in implementing a policy measure, often, unintended consequences could also happen.

In this section, we will consider the rationale behind the various methods (or policies) of government intervention and examine their resultant effects (both intended and unintended consequences) on society.

In general, **governments** intervene in markets for the following **microeconomic objectives. In JC1, we focus on these 2 microeconomic objectives (and in JC2, we focus on other macroeconomic objectives):**

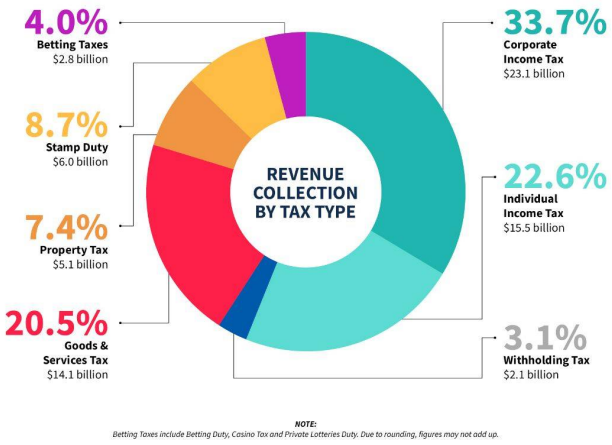
1. To improve **Efficiency** in resource allocation: by encouraging, discouraging or prohibiting the production or consumption of a good
2. To improve **Equity** in resource allocation: by making certain goods more affordable, or redistributing incomes

In the subsequently sections, we will consider the 4 methods of government intervention:

a. Taxes (Direct and indirect taxes)
b. Subsidies
c. Price controls (Maximum and minimum prices)
d. Quantity controls (Quotas)

1.4. Taxes (Direct and indirect taxes)

Taxes can be either direct or indirect. As seen from the figure below, Singapore's government main sources of tax revenue come from corporate and individual income tax (direct taxes), and Goods and Services Tax (GST) (indirect taxes).



Source: Inland Revenue Authority of Singapore (IRAS) 2022/23 annual report

Direct taxes

A **direct tax is paid directly by the taxpayer to the tax authority** (the Inland Revenue Authority in the case of Singapore). Examples of direct taxes would be **corporate income tax** and **individual income tax**. Direct taxes are usually used by the government to achieve macroeconomic objectives such as (a) to re-distribute income towards a more equitable income distribution and inclusive economic growth, or (b) to stimulate aggregate demand, economic growth and employment. Below is a brief explanation of what direct taxes are and how it might be used to achieve these macroeconomic objectives.

NOTE: You will learn more about the use of direct taxes in JC2 under Topic 15 Fiscal Policy.

(a) In Singapore, the **progressive income tax system**[1] is used to re-distribute income to achieve a more equitable income distribution and a more inclusive economic growth. The rich are taxed proportionally more than the poor. The government then redistributes the tax revenue collected from the rich to the poor in the form of transfer payments such as cash vouchers and income supplement. The progressive income tax system in Singapore effective from Y2024 onwards can be seen from the table below.

(b) In many countries, direct taxation can be used to influence consumption and investment decisions, which will in turn stimulate aggregate demand, economic growth and employment. A lower personal income tax rate increases the level of disposable income and purchasing power of individuals, and thus increase consumption. Similarly, lower corporate tax could increase the after-tax profits for a firm's investment and thus increase investments.

Resident tax rates

From YA 2024 onwards

Chargeable Income	Income Tax Rate (%)	Gross Tax Payable ($)
First $20,000	0	0
Next $10,000	2	200
First $30,000	-	200
Next $10,000	3.50	350
First $40,000	-	550
Next $40,000	7	2,800
First $80,000	-	3,350
Next $40,000	11.5	4,600
First $120,000	-	7,950
Next $40,000	15	6,000
First $160,000	-	13,950
Next $40,000	18	7,200
First $200,000	-	21,150
Next $40,000	19	7,600
First $240,000	-	28,750
Next $40,000	19.5	7,800
First $280,000	-	36,550
Next $40,000	20	8,000
First $320,000	-	44,550
Next $180,000	22	39,600
First $500,000	-	84,150
Next $500,000	23	115,000
First $1,000,000	-	199,150
In excess of $1,000,000	24	

Source: IRAS

[1] A progressive tax is one where as workers' income rises, the percentage of income paid in tax rise. In contrast, a regressive tax is one where as income rises, the percentage of income paid in tax falls.

Indirect taxes

Indirect taxes are paid indirectly from consumers to the government through any expenditure/spending with the producers. This means indirect taxes are paid to the tax authorities by the producers of the good or service. An example of indirect taxes would be **Goods and Services Tax (GST).**

An increase in indirect tax would mean an increase in cost of production to the firm. Hence, resulting in a decrease in supply of a good.

2.1.1 Rationale for indirect taxes

a. Indirect taxes are another way (besides direct taxes) to raise **revenue for the government** to fund provision of public goods such as national defence, and to subsidise the production/ consumption of merit goods such as education and healthcare, which also helps to improve allocative efficiency.

b. In some situations, the free market may fail to allocate resources efficiently to maximize the welfare of society. This happens when too much or too little of a good/service is produced. So indirect taxes imposed by the government seek to discourage/encourage the consumption or production of a good through changing the behaviour of consumers and/or producers, hence **achieving an allocative efficient outcome**.

***NOTE**: More will be covered under Topic 5: Microeconomic Objectives and Policies.*

2.1.2 Analysis of indirect taxes

As mentioned earlier, indirect taxes are imposed on producers. An imposition or increase in the indirect taxes will lead to an increase in cost of production, while a removal or decrease in indirect taxes will lead to a decrease in cost of production. A change in cost of production resulting from a change in indirect taxes will affect the profit-maximising producers' incentive to produce.

a. **Specific taxes** (recall Topic 2, Section 7.4.1)

When the tax is a specific or per unit tax, the tax is levied as a fixed amount per unit of the good sold. With reference to Figure 5, the imposition of an indirect tax will shift the supply curve parallel leftwards from SS to SS_1 by the amount of tax because the amount of tax imposed is the same for all prices. The vertical distance between the two supply curves represents the amount of the per unit tax.

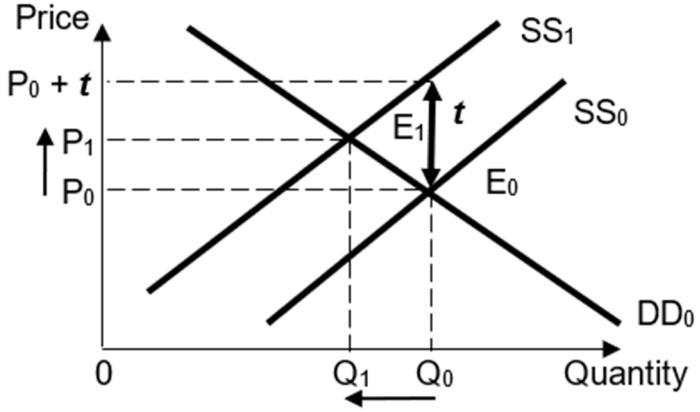


Figure 5: Specific Tax

b. Ad-valorem tax

An ad-valorem tax is levied as a fixed percentage of the price of the good sold. The ad-valorem tax causes an upward but non-parallel shift (pivoted) of the supply curve. This is because the absolute amount of tax imposed is different for different prices but the percentage tax is the same. The post-tax supply curve (SS_1) diverges from the pre-tax supply curve (SS) as quantity increases.

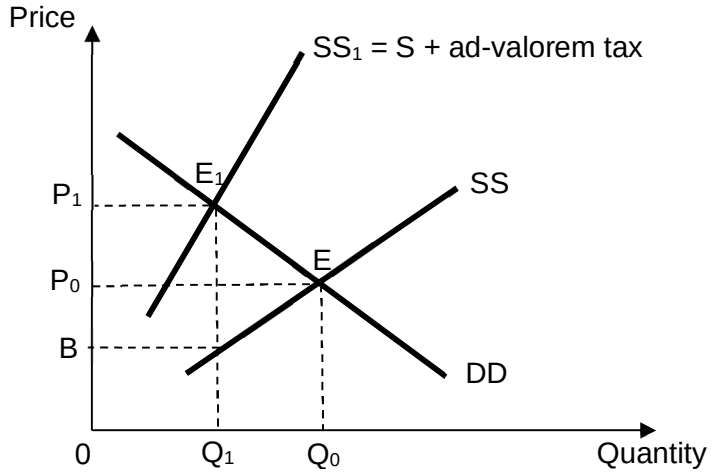


Figure 6: Ad-valorem tax

2.1.3 Impact of indirect taxation

a. On price

With the imposition of the specific (per unit) tax, the direct impact will be on the producer because it is levied on the goods they produced. The decrease in supply is represented by a leftward shift of the supply curve, resulting in an increase in the equilibrium price, ceteris paribus. **However, the extent of the increase in price depends on the PED of the good being taxed.**

In Figures 7a and 7b, the magnitude of the shift in supply curve is the same because of the equal amount of indirect specific tax, t, that has been imposed on the producers. When demand for a good is more price elastic, consumers are highly responsive to price changes. The indirect specific tax raises the equilibrium price from P_0 to P_1, and that causes consumers to reduce quantity demanded from Q_0 to Q_1 by more than proportionately. As a result, producers cannot easily pass on the tax burden, leading to a smaller price increase. Conversely, when demand is price inelastic, consumers are less responsive to price changes, allowing producers to shift more of the tax burden onto consumers, resulting in a larger price increase. Thus, the **extent of price increase is larger** when **demand** is **relatively more price inelastic (relative to price elasticity of supply)**.

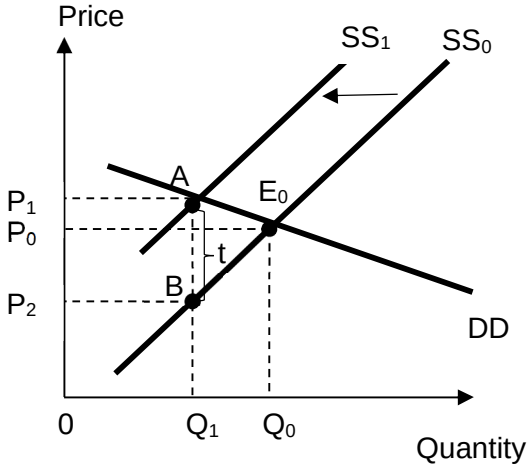


Figure 7a: Price Elastic Demand

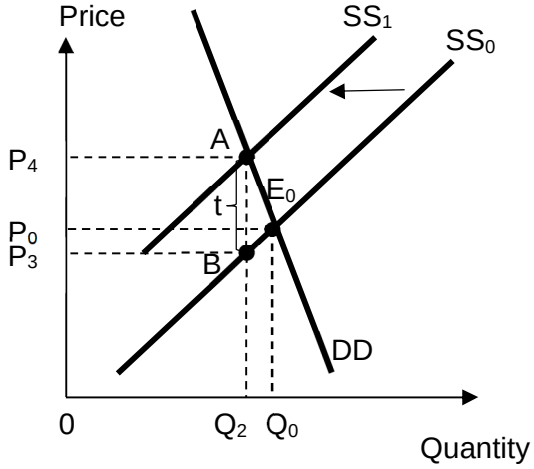


Figure 7b: Price Inelastic Demand

b. On output

The extent of the fall in quantity as a result of indirect specific tax depends on the PED. As seen from Figures 7a and 7b, we can conclude that when an indirect tax is imposed on a good with demand that is relatively more price elastic, there is a greater decrease in quantity compared to when demand is relatively less price elastic. This is because when demand is relatively more price elastic, the indirect specific tax raises the equilibrium price from P_0 to P_1, and that causes consumers to reduce quantity demanded from Q_0 to Q_1 by more than proportionately.

Another angle for policy makers to note is that when a good has a relatively price inelastic demand, a more significant amount of indirect tax is necessary to bring about a targeted fall in equilibrium quantity for a good (e.g., cigarettes). This is because any indirect tax that rises equilibrium price will only result in a less than proportionate fall in quantity demanded and have limited effectiveness.

c. On tax revenue

Tax revenue is the product of the specific (per unit) tax and the new equilibrium quantity transacted in the market. **Again, the amount of government tax revenue collected from the imposition of an indirect tax depends on the PED.** Tax revenue collected by the government is larger when it is imposed on goods with relatively price inelastic demand.

For instance, an indirect tax is imposed on cigarettes (or alcohol). For a good where demand is price inelastic due to it being a habit-forming good with little or no close substitutes especially for heavy smokers, the government will be able to raise significant tax revenue, i.e. in Figure 7b, area P_3P_4AB.

d. On producer revenue/consumer expenditure [recall Topic 3, Section 2.5(b)]

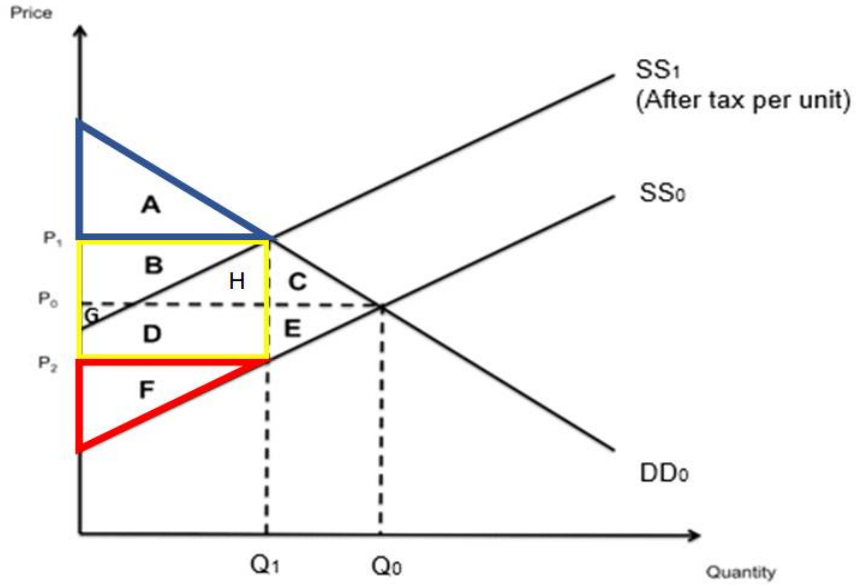
The change in producer revenue/consumer expenditure depends on the PED. If the demand for a good is relatively more price elastic, an increase in price due to taxation will result in a more than proportionate fall in quantity demanded, and hence an overall fall in producer revenue/consumer expenditure from $0Q_0E_0P_0$ to $0Q_1AP_1$ as shown in Figure 7a.

If the demand is relatively more price inelastic, an increase in price due to taxation will result in a less than proportionate fall in quantity demanded and hence an overall increase in producer revenue/consumer expenditure from $0Q_0E_0P_0$ to $0Q_2AP_4$ as seen in Figure 7b.

NOTE: Producers will not be able to keep the full producer revenue as they need to pay part of it as tax revenue for the government. In Figure 7b, although producer revenue has risen from $0Q_0E_0P_0$ to $0Q_2AP_4$, the producers have to pay P_3P_4AB to the government as tax revenue, and the post-tax revenue left is only $0P_3BQ_2$.

e. On consumer and producer surplus

Figure 8: Indirect Taxes



Original consumer surplus	A + B + H + C
New consumer surplus	A
Change in consumer surplus	- B - H - C
Original producer surplus	G + D + E + F
New producer surplus	(B + G) = F
Change in producer surplus	- G - D - E
Net change in producer and consumer surplus	- B - H - C - G - D - E
Government tax revenue collected	B + H + G + D

Areas B, H, G and D are transferred from consumer and producer surplus to government tax revenue. The overall loss of societal welfare is C + E.

Connect, Extend, Challenge

Discuss how relative price elasticities of demand and supply in a market impact the consumer and producer surplus following an imposition of an indirect tax.

f. On society's welfare

Assuming that there are no sources of market failure present initially, the imposition of the indirect tax resulted in a loss of societal welfare of areas C and E.

Connect, Extend, <u>Challenge</u>

Why would a government impose policies to create a welfare loss (allocative inefficiency) to society?

In the previous and subsequent policies, you will notice that government intervention creates a welfare loss.

NOTE: Not all government intervention creates welfare losses. In later topics, you will learn that when the free market fails in the first place, government intervention will increase social welfare instead.

2.2 Subsidies

A subsidy is a grant given by the government to encourage the production/consumption of a good or service. It decreases cost of production for producers and increases supply of a good or service.

2.2.1 Rationale for subsidies

a. To increase efficiency

Like taxation, subsidies aim to help the market to achieve allocative efficiency. They are usually given for goods that are under-valued by the market and thereby under-produced/consumed (e.g., education). By giving subsidies, it increases the production/consumption of the good, hence achieving an allocative efficient outcome.

***NOTE:** More will be covered under Topic 5: Microeconomic Objectives and Policies.*

b. To promote equity

Equity concerns 'fairness' in the distribution of goods and services across society, with focus on whether low-income groups have ample access. Though the free market is efficient in allocating limited resources, the equilibrium price of the goods might be so high that only the rich can afford them. This is a pressing issue for governments especially when these goods are necessities such as rice and flour. The government can therefore provide a subsidy to the suppliers of these essential goods, helping to lower the cost of production. This increases the supply of the goods which in turns lowers the equilibrium price of the good, assuming ceteris paribus. Thus, making it more affordable for the lower income groups.

c. To encourage firms to adopt practices that enhance productivity

To remain competitive in the global market, Singapore must constantly innovate. The government can encourage innovation by providing firms with subsidies such as innovation grants. This can help workers to enjoy higher wages, and also for Singapore to achieve its macroeconomic objectives such as sustainable economic growth.

NOTE: *More will be covered under Topic 5: Microeconomic Objectives and Policies.*

2.2.2 Analysis of subsidies

Subsidies can have the same effect as lowering the cost of production; hence profit-maximising producer will be incentivised to produce more, resulting in an increase in quantity supplied at each and every price, increasing supply ceteris paribus. The vertical distance between the supply curves is the amount of subsidy per unit.

a. On price

The direct impact of providing a subsidy will be on the producer because it is levied on the goods they produced. A subsidy to producers has the same effect as lowering the costs of production and therefore increases supply, ceteris paribus. This in turn lowers equilibrium price and increases equilibrium quantity. **However, the extent of the decrease in price depends on the price elasticity of demand (PED), relatively to price elasticity of supply (PES).**

In Figure 10a and b, notice that it is the same amount of specific subsidy (per unit) that has been imposed on the producers. However, the **extent of price decrease** is larger when the **demand that is relatively more price inelastic (relative to price elasticity of supply).** This is because when the government gives a subsidy to the producers, there will be a rise in supply and fall in equilibrium price. When demand is relatively more price inelastic, as in Figure 9b, the fall in price will lead to only a less than proportionate rise in equilibrium quantity from Q_0 to Q_1. So, the producers have to reduce price more significantly from P_0 to P_1 to clear any surpluses.

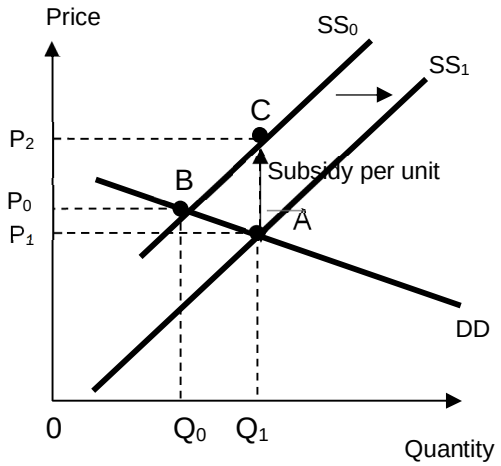


Figure 9a: Price Elastic Demand

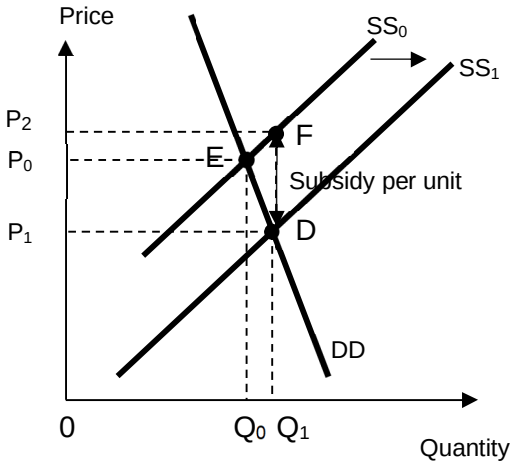


Figure 9b: Price Inelastic Demand

Connect, Extend, Challenge

Discuss how relative price elasticities of supply in a market impact the price following a provision of a subsidy.

b. On output

The extent of the increase in output depends on PED. With reference to Figures 9a and 9b above, the increase in output is greater when demand is relatively more price elastic.

c. On producer revenue/consumer expenditure *(an application of PED concept)*

The change in producer revenue/consumer expenditure also depends on PED. If the demand for a good is relatively more price elastic, a fall in price due to a subsidy will result in a more than proportionate increase in quantity demanded and hence an overall increase in producer revenue/consumer expenditure from $0Q_0BP_0$ to $0Q_1AP_1$ as shown on Figure 9a.

If the demand is relatively more price inelastic, a fall in price due to subsidy will result in a less than proportionate increase in quantity demanded and hence an overall fall in producer revenue/consumer expenditure from $0Q_0EP_0$ to $0Q_1DP_1$ as shown on Figure 9b.

NOTE: Producers will not only receive producer revenue, they will also receive the government subsidy. In Figure 9b, although producer revenue has fallen from $0Q_0EP_0$ to $0Q_1DP_1$, the producers will also receive a subsidy of area P_1P_2FD from the government. So, the overall producer revenue plus subsidy will be more than the original producer revenue of $0Q_0EP_0$.

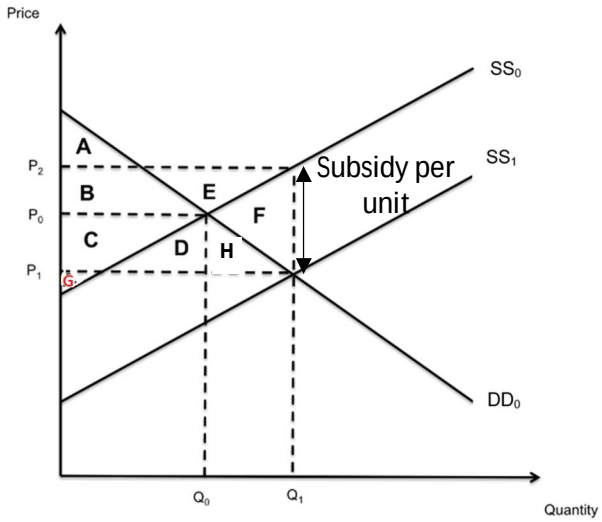
d. Government expenditure

The analysis for government expenditure is slightly different from the government revenue in the tax analysis. In the case of subsidies, the goal is to induce consumption to the socially optimal amount of output, i.e. to increase quantity. For the consumer whose demand for the good is price elastic, a small decrease in price will lead to a more than proportionate increase in quantity demanded, but for the consumer whose demand for the good that is price inelastic, a larger fall in price is required to achieve the same amount of increase in quantity demanded.

Therefore, to achieve the socially optimal level of consumption, government's expenditure on subsidy would have to be larger if the demand for the good is price inelastic to induce the needed increase in quantity.

e. On consumer and producer surplus (The following analysis is assuming a perfectly competitive market i.e., there is no market failure present)

Figure 10: Subsidies



Original consumer surplus	A+B
New consumer surplus	A + B +C + D + H
Change in consumer surplus	C + D + H
Original producer surplus	C + G
New producer surplus	C + G + B + E
Change in producer surplus	B + E
Net change in consumer and producer surplus	B + E + C + D + H
Government expenditure	B + C + D + E + F + H

g. On society's welfare

Assuming that there are no sources of market failure initially, the imposition of the subsidy will result in an increase in consumer and producer surplus.

Areas B, C, D, E, F and H represent the total amount of government subsidy. They are transferred from government to consumer and producer surplus.

However, there is a loss of societal welfare is F.

2.3 Price controls

In the free market, the equilibrium price is determined at the intersection point of the demand and supply curves. However, this equilibrium price can be too high or low. If the goods are priced too high, then only the rich will be able to afford. Conversely, when price is too low, it will affect the livelihood of producers. Hence, this warrants government intervention in the form of price controls.

Government price controls can be in the form of setting a **maximum price (price ceiling) or a minimum price (price floor).**

2.3.1 Maximum price (Price ceiling)

a. Definition

A price ceiling is a legally established maximum price. This means that producers are prohibited from selling the good above the maximum price set.

For the maximum price regulation to be effective, the **price ceiling must be set below market equilibrium price**. A price ceiling that is set above the market equilibrium price has no effect at all because the market equilibrium price, which was determined in the free market where demand intersects with supply, is still attainable.

b. Rationale

A price ceiling is usually imposed with the goal (intended consequence) of achieving equity. For example, consider the case of apartment rental rates. If there is a sudden surge in the demand for rental apartments, this will lead to an increase in the equilibrium price. As a result, those in the lower-income group might not be able to afford the higher rental fees. Hence, to ensure affordability of basic necessities such as housing, the government can intervene in the apartment rental market by imposing a maximum price (price ceiling) on rental apartment rates. In some countries, price ceilings have also been imposed on essential goods such as food and petrol.

c. Effects

With the imposition of price ceiling, the following effects (unintended consequences) can be observed:

1. The new market price transacted will be $P_{MAX.}$
2. At P_{MAX}, shortage occurs, where the quantity demanded is greater than quantity supplied. The shortage cannot be eliminated by the free market due to imposition of price ceiling.
3. There is a reduction of producer's revenue from 0PEQ to $0P_{MAX}YQ_{MAX.}$
4. The size of the shortage depends on the price elasticities of demand and supply. The greater the price elasticity of demand and supply, the **greater** is the resultant shortage.
5. As a result of the persistent shortage, this can lead to the formation of black markets.
6. Even if there was no formation of the black market, the implementation of price control will result in a welfare loss (area XYE).

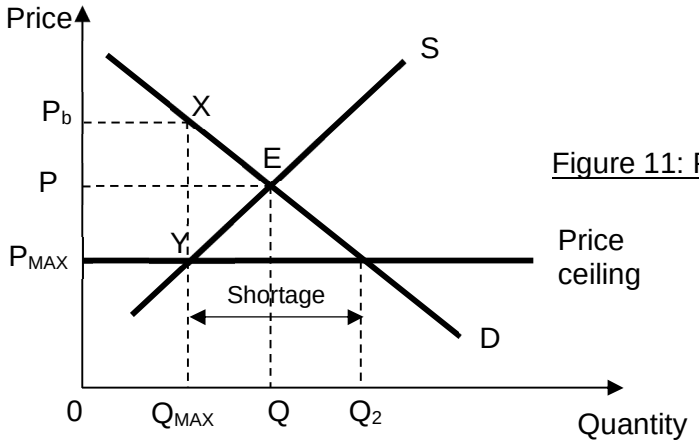
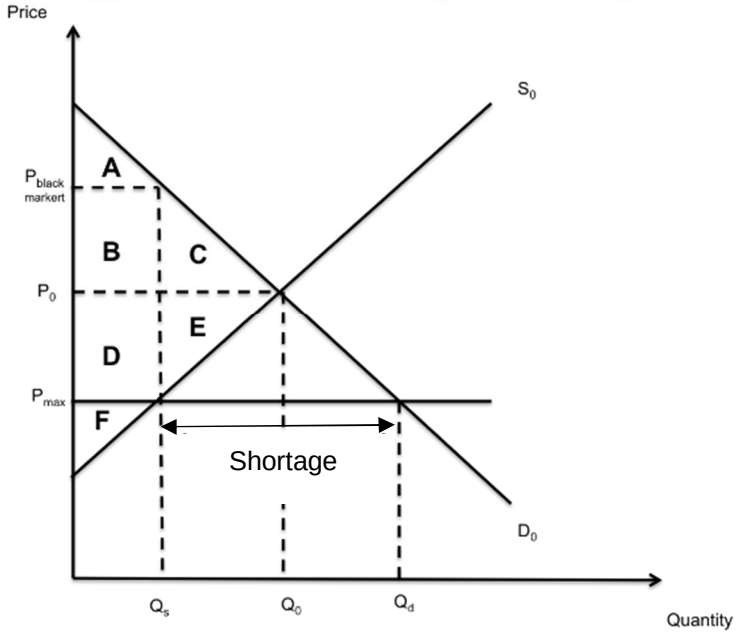


Figure 11: Price ceiling

d. On consumer and producer surplus

Figure 12: Maximum price (Price ceiling)



Original consumer surplus	A + B + C
New consumer surplus	A + B + D
Change in consumer surplus	D - C
Original producer surplus	D + E + F
New producer surplus	F
Change in producer surplus	- D - E
Net change in consumer and producer surplus	- E - C

e. Unintended consequence: Creation of black markets

A black market is one where sellers ignore the government's price restriction and sell illegally above the legal maximum price.

As seen from Figure 11 above, some consumers are willing to pay beyond P_{MAX} to consume the goods. In the extreme circumstance where sellers are able to get hold of Q_{MAX} amount of goods, they would be able to sell Q_{MAX} amount of goods at P_b. By doing so, producers in the black market would be able to earn an extra revenue of $P_bXYP_{MAX.}$

The more price inelastic the demand for the good, the greater the revenue earned by the black marketer because consumers are willing to pay an even higher price to obtain the good. Hence, the problem of black market or illegal trading is likely to be greater.

One of the problems with the black market would be the issue of equity. If this good was deemed as a basic necessity and the intent of the price control to ensure affordability for the lower income group, then the existence of black market will worsen the affordability issue for the lower income group because it would be the rich who will be able to purchase the good. This would lower the effectiveness of the policy.

f. How could the government mitigate the problems arising from the black market?

The imposition of the price ceiling will lead to a persistent shortage and can lead to the formation of black market.

To mitigate the resultant shortage, government can consider the following measure:

- **Government can use policies to encourage production**

To reduce the shortage, government can consider **direct provision** of those goods. This means that the government takes over the provision of the goods[2]. For goods such as food grains, governments may have kept stockpile from previous harvests and this stockpile can be released onto the market to increase supply. Alternatively, they can consider giving subsidies or tax relief to firms to encourage a greater production. Through the increase of supply, the new equilibrium price would be that of the minimum price.

However, it is questionable if government knows exactly how much to produce or the amount of subsidies to be given to firms, such that they will be able to increase production. Furthermore, these policies would put a strain on government's budget.

To prevent the formation of black market given the shortage, government can consider the following measures:

- **Government rationing**

The government can distribute sufficient coupons to match the available quantity supplied at Pmax. These coupons may be distributed equitably among the population according to criterions such as age, family income or family size. However, this does not eradicate the persistent shortage.

- **Random allocation**

The government could randomly allocate the goods to consumers to prevent them from ending up in the hands of black market producers (i.e., scalpers). However, there is still a persistent shortage, and the government cannot ensure that the goods are allocated to people who truly needed them.

- **First-come-first-served basis policy**

The government can employ a first-come-first-served basis mechanism. However, this will inevitably result in long queues and the consumers have to incur opportunity cost as a result of the choice to wait in line.

[2] Take note that direct provision is not free provision. Under direct provision, consumers must still pay to use the goods and services that are provided for by the government. (e.g. public hospitals are provided for by the government but patients still pay to use the healthcare services.)

g. Application of price ceiling in the housing market

Example of a maximum price: Rent control

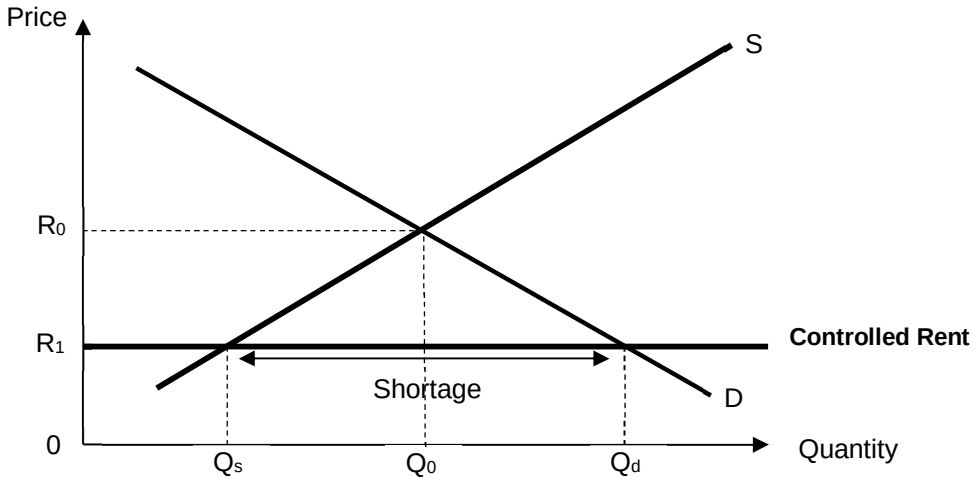


Figure 13: Rent control

Some cities in the U.S practice forms of rent control, to prevent landlords from imposing rent increases that targets vulnerable groups, such as the elderly or family with young children. Such groups tend to have demand that is relatively price inelastic as it is difficult to find a substitute for their current rental location in the short run.

Rent control involves fixing a maximum rent at R_1, which is below the market equilibrium rent of R_0. As explained earlier, this results in a shortage in the rental market as Qdd > Qss. Despite the intention of protecting vulnerable groups, this may end up resulting in greater welfare loss, as these groups may not be able to find a rental home due to the shortage.

Moreover, the lower rent being received by landlords will reduce their ability to improve or maintain the quality of the rental homes. This will further reduce consumer welfare.

NOTE: *In reality, the imposition of rent control is not so simplistic and often comes with other measures to ensure that shortages are minimised. Nonetheless, it is almost inevitable that some groups will be made worse off with seemingly well-intended policies.*

2.3.2 Minimum price (Price floor)

a. Definition

A price floor is a legally established minimum price. Firms affected are permitted to sell the goods at prices at or above the minimum price.

A price floor is **only effective if it is set above the equilibrium price**. A price floor that is set below the market equilibrium price has no effect at all because the market equilibrium price is still attainable.

b. Rationale

- A price floor is set to protect the incomes of producers (intended consequence). This is especially true for producers (farmers) of agriculture products as they are susceptible to be faced with drastic fluctuating prices, thereby eroding their income. The drastic fluctuation in price is often due to the supply of these goods being subjected to weather conditions and coupled with the fact that the demand for the goods tends to be price inelastic in nature.

- A price floor is also often set to protect low-skilled/low-wage workers (intended consequence) by offering them a wage that is above the market equilibrium. Minimum wage legislation may also help to reduce poverty.

c. Effects

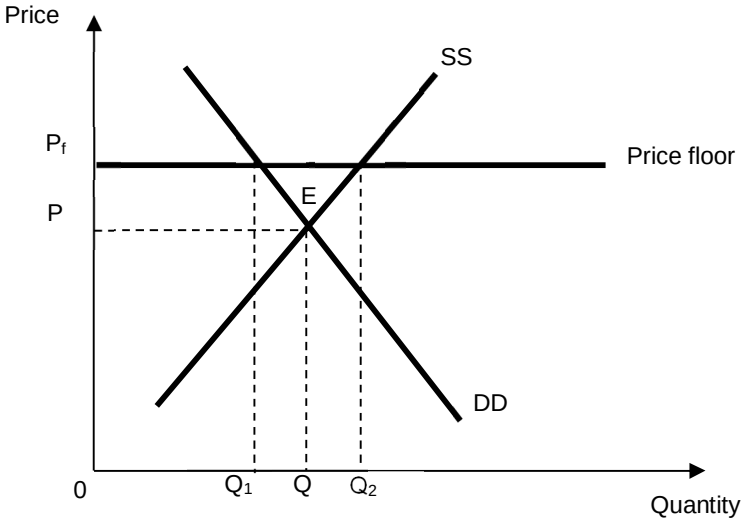


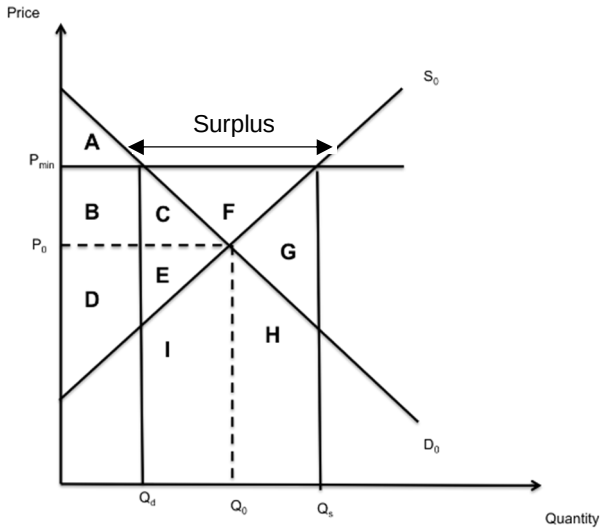
Figure 14: Minimum Price (Price floor)

With the imposition of price floor, the following effects (unintended consequences) can be observed:

1. The **price increases** from P to P_f.
2. The **quantity exchanged falls** from Q to Q_1 because quantity demanded has fallen.
3. The effect on **producer revenue** or incomes of the producers depends on PED. **If demand is price inelastic as in the case of agricultural products, then the imposition of a price floor will increase the incomes (i.e. producer revenue) of farmers significantly**.
4. By imposing the price floor, it results in a surplus of $\mathbf{Q_2Q_1}$ because the quantity demanded is only Q_1 but the quantity supplied is Q_2.
5. The extent of the surplus depends on PED and PES. The more price elastic the demand and supply, the greater the resultant surplus.
6. A price floor leads to market distortion because there is a greater quantity supplied of the good than it would under the free market (where there was no government intervention).
7. Furthermore, a price floor might cause firms to be even more inefficient. This is because the high prices might not motivate firms to find a more efficient method of production and to reduce their cost of production if their total revenue and thus profits are being protected by price floors. The high price might discourage firms from producing alternative goods which they could produce more efficiently, or which are in higher demand, because these alternative goods have a lower equilibrium price.

d. On consumer and producer surplus

Figure 15: Minimum price (Price floor)



Original consumer surplus	A + B + C
New consumer surplus	A
Change in consumer surplus	- B - C
Original producer surplus	D + E
New producer surplus (if government buys up the surplus)	B + C + D + E + F
New producer surplus (if government does not buy up the surplus)	D + B
Change in producer surplus	B - E
Net change in consumer and producer surplus	- C - E

e. What can the government do about the persistent surplus?

- **Buy up the surplus**

Effective price floors lead to surplus production. The surplus created by price floors necessitates action by the government to buy up the surplus. Taxpayers' money is used to pay the subsidies or run the warehouse used to stock up the surpluses. Hence, an opportunity cost is incurred in the usage of such funds.

- **Dumping** (*more will be covered in the topic of International Trade)*

The good may be dumped in other countries, selling the good at a price that is below the marginal cost of production. Assuming the demand for the good is price elastic, dumping would cause an increase in export revenue since the quantity demanded will rise by more than proportionate extent.

- **Divert into other markets**

Government can divert the surplus as a factor input in the production of another final good. For example, a surplus in milk can be diverted to the production of cheese.

- **Dispose it**

Though this will be a wastage of resources, governments can consider disposing the surpluses, especially for perishable goods. This disposal incurs opportunity cost to society as the resources used in production could have been better used for production of other goods and services within the economy.

2.4 Quantity controls (Quotas)

a. Definition

A quota is a quantitative restriction on output that is imposed by the government through legislation and regulation. For a quota to be effective, the quota must be set below the market equilibrium quantity (if not, the market equilibrium quantity is still attainable, and the quota will be deemed ineffective).

b. Rationale for quotas

Quotas may be employed by the government as a measure to restrict the amount of goods exchanged in the free market, where a lower amount of the good (intended consequence) is deemed more optimal by the government. For example, in land scarce Singapore, the government deemed that a lower amount of cars is more optimal for better management of traffic flow. Hence, to control the car population, the government intervenes in the car ownership market with the vehicle quota system *(more under Section 2.4.1*).

c. Effects of quotas

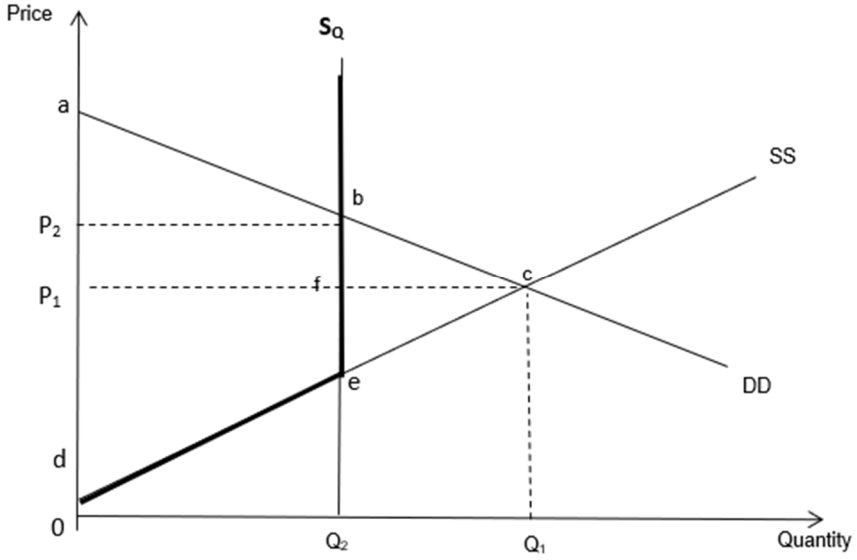


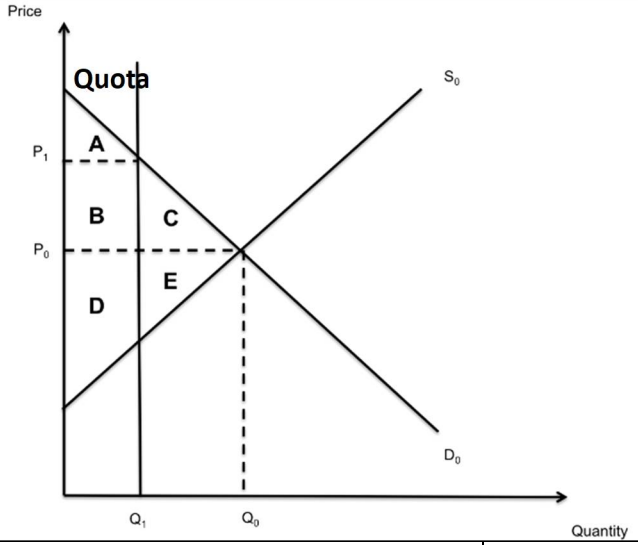
Figure 16: Quantity control - quota

Initially at market equilibrium, the equilibrium price is at P_1 and equilibrium quantity is at Q_1. With the imposition of the quantity control (quota), the quantity is now fixed at Q_2. The 'new supply curve' is represented by the bold line in Figure 16. As a result, the new equilibrium price is higher at P_2.

Other than the higher price (unintended consequence), there is also negative welfare impacts (unintended consequence) as a result of the quota.

d. On consumer and producer surplus

Figure 17: Quantity controls (Quotas)



Original consumer surplus	A+B+C
New consumer surplus	A
Change in consumer surplus	- B - C
Original producer surplus	D + E
New producer surplus	D + B
Change in producer surplus	- E + B
Net change in consumer and producer surplus	- C - E

2.4.1 Application of quota in Singapore's context

An example of how governments control the quantity of a good that can be offered for sale is Singapore's vehicle quota system where a fixed number of Certificate of Entitlements (COEs) are released for bidding each cycle. A COE must be acquired before a person can register a vehicle for use on the road for up to 10 years. This measure is used in conjunction with the Electronic Road Pricing (ERP) scheme to cub traffic congestion.

The price of a COE is determined by market demand through a public tendering system. By limiting the number of COEs issued each month, the vehicle quota system has served as an effective means to keep the growth of vehicle population at a very low level. The price of the COE does not include the price of the car; hence this explains why cars are extremely expensive in Singapore.

NOTE: *More about the COEs will be discussed in Topic 5: Microeconomic Objectives and Policies*

Connect*, *Extend, Challenge

In the News

COE supply for Aug to Oct to drop by 11.5% under new counting method aimed at reducing fluctuations

There will be fewer certificates of entitlement (COE) available for all vehicles except motorcycles for the November to January quota period.

Overall, the COE supply will fall from 9,122 a month currently to 8,635. Announcing the new three-month supply on Monday (Oct 23), the Land Transport Authority said there will be 6,108 COEs a month for cars, down from 6,200 currently.

Source: The Straits Times, 23 Jul 2022

How can this change in COE supply be reflected in a demand/supply diagram?

3. Application of Demand and Supply Analysis to the Factor Market: The Labour Market

Key points to note as you go through this section:

1. *The following analysis of the labour market is just an application of demand and supply. DO NOT treat it as a totally new topic, but rather, think about how the factors affecting labour demand and supply are just a variant of the generic demand and supply factor you learnt previously.*

2. *To **stretch** yourself subsequently, you should attempt to apply demand and supply analysis to other factor markets such as oil, steel, capital goods. The more you run through different applications, the faster demand and supply analysis will become second nature to you.*

Thus far, we have examined the impact on changes in demand and supply on the product market. Unlike the product market, the labour market is a market for factor of production. The demand and supply tools that we have used to analyse the impact on product market will be useful in our analysis of the labour market.

3.1 Wage determination in a free market

In the free market for labour, wage rate (price of labour) is determined by the interaction of the market demand for and supply of labour.

At this juncture, it is important to note that labour is a derived demand. Derived demand is the demand for a factor of production that depends on the demand for the good that uses it. When there is an increase in demand for goods, the derived demand for labour will increase because more labour is required to produce the goods.

In a competitive market, the demand for labour is downward sloping. Labour demand curves slop downward because of the Law of Diminishing Returns. As a firm hires more and more workers, each additional worker contributes less and less additional output to the firm. Hence, the greater the quantity of labour employed; it will result in a lower wage.

The market for supply of labour is made up on individuals who are able and willing to work for a given wage rate. The supply of labour is upward sloping due to the increasing marginal disutility of work as people increase their work hours. With increasing hours of work, individuals will have less leisure hours and any discomfort experience in doing their job tends to increase due to boredom or tiredness. Hence, in order to incentivise more people to take up the job, a higher wage rate is required, ceteris paribus.

3.2 Wage determination in a free market using demand and supply model

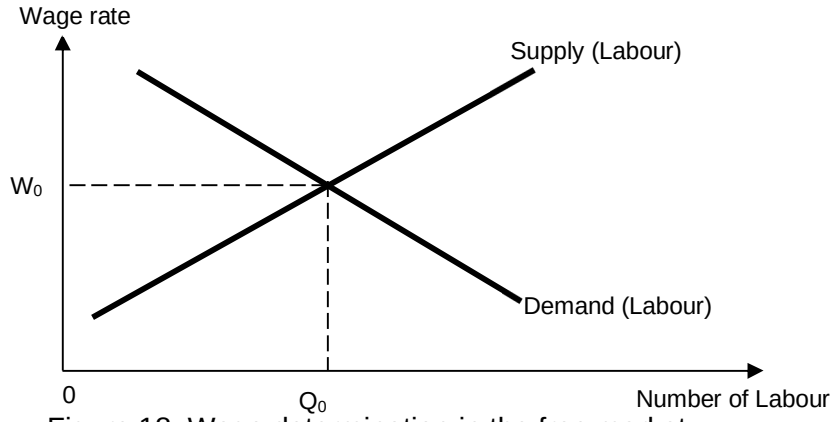


Figure 18: Wage determination in the free market

Unlike the product market, in the labour market the vertical axis is wage rate instead of price. The wage rate is the price of labour. Wage rate (W_0) is determined by the interaction of the demand for and supply of labour. At any wage rate above W_0, there would be a surplus of labour (quantity supplied is greater than quantity demanded of labour) and this would result in a downward pressure on wage rate. This is because competition for the limited number of jobs will force the wages downwards. Hence, employees will be willing to settle for a lower wage in order to secure a job.

At wage rate below W_0, there will be a shortage of labour (quantity demanded is greater than quantity supplied of labour) and this will exert an upward pressure on wage rate. This is because competition amongst firms for workers will drive wages upwards. Hence, employers will be willing to use higher wages to attract job applicants in the face of labour shortage.

3.3 Non-wage determinants of demand and supply of labour

3.3.1 Non-wage determinants of demand for labour

a. Changes in the price of the final products

As mentioned earlier, labour is a derived demand. If there is an increase in demand for a final product, this will result to higher equilibrium price and quantity. In order to produce the higher quantity, firms will increase their demand for labour. Hence, the demand curve for labour will shift to the right, resulting in a higher equilibrium wage and quantity of labour.

In the same way, a decrease in the demand of final product will lead to a fall in demand for labour.

b. Changes in productivity of labour

Due to an increase in productivity as a result of better education, the demand for labour can increase. This is because workers who undergo education and retraining programmes are deemed more attractive to employers because of the higher output per worker at the same wage rate. Hence, with better education, ceteris paribus, the demand for labour can increase.

c. Changes in other factors of production used in production

Capital can be seen as a substitute for labour in for certain production processes. Hence, with a decline in price of machinery, profit maximising firms will substitute machinery in place of labour. Similarly, with the rise of self-ordering kiosk machines that can substitute labour in fast food restaurants, the demand for labour will decrease.

However, there are some resources that are complementary with labour. Therefore, the change in demand and supply conditions of these resources will affect the demand for labour in the same way.

3.3.2 Non-wage determinants of supply of labour in an economy

a. The size and composition of population

Birth rates and death rates can affect the size of the population. A declining birth rate can lead to a falling supply of labour in the market. However, a welcoming foreign labour policy can lead to an increase in labour supply as more foreign labour are able to join the workforce.

b. Retirement age

In view of an ageing population, an increase in retirement age can help the economy to increase the labour supply.

c. Changes in income tax and benefits level

A high personal income tax rate can reduce the incentive to work. This is because the disposable income of the individual will decrease, hence it reduces the willingness to work. In the same way, an overly generous unemployment benefit system may do the same effect. Thus, reducing income tax rates and unemployment benefits will help to increase the labour supply.

3.4 Wage adjustment process

In a perfectly competitive free labour market, any change in wage can be accounted for by change(s) in the demand for and/or supply of labour. Changes in wages is achieve through the wage adjustment process.

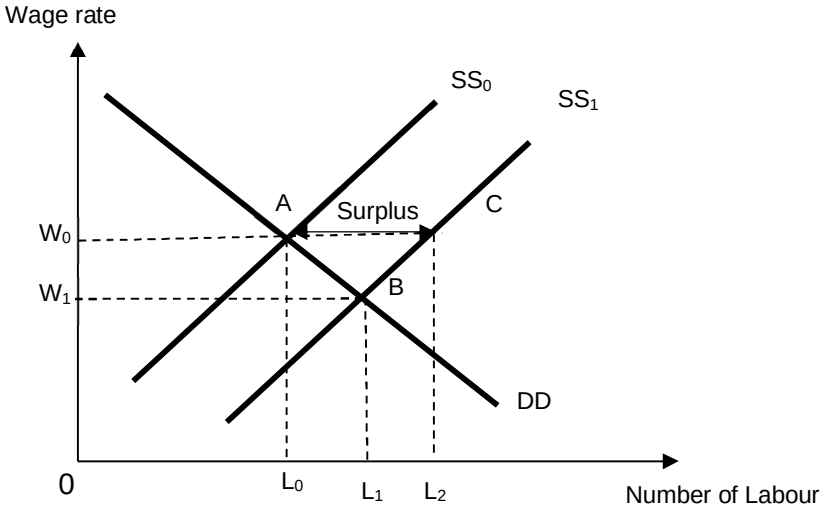


Figure 19: Increase in supply of labour

Consider the case where there is an increase in supply of labour as a result of a change in foreign labour policy to a country, this can be represented by a rightward shift of supply of labour. At the original wage rate, a surplus is formed. Since there are too many workers competing for the same job, this will drive wage downwards. The wage will keep falling until the quantity demanded for labour and quantity supplied of labour equalised. The falling wage serves as an incentive to the producers to hire more labour, as the fall in costs of production will increase profits. Hence, when wages fall to W_1 firms will increase their quantity demanded for labour as seen from point A to B. The lower wage also serves as a signal to workers, providing them less incentive to work. Hence, the quantity supplied of labour falls from L_2 to L_1. The new equilibrium wage is W_1 and equilibrium quantity of labour is Q_1.

In the same way, if the demand of a good increases, the derived demand for labour will increase. Hence, this will result in a shortage at the original wage rate. The shortage will pressure wages upwards until the quantity demanded for labour is equal to quantity supplied of labour.

3.5 An economic analysis of minimum wage

Thus far, our analysis has been on perfectly competitive free labour market. The perfectly competitive free labour market implies that there should be no government intervention. Though the free labour market is efficient in allocating resources and determine the equilibrium wages, it does not ensure equity because the disparity of wages in different industries can be large and the livelihood of those earning low wages can be affected. This warrants the government to enact a minimum wage policy; it dictates that workers must earn at least the stated amount. The minimum wage law is practised in some countries like Indonesia and the UK. It is an example of government intervention in the labour market to increase the wage rate of some workers than what it would otherwise be in a free market.

3.5.1 Effects of the minimum wage law

Figure 20 shows the demand and supply of labour. The equilibrium wage rate is W_e and the number of workers employed is L_e.

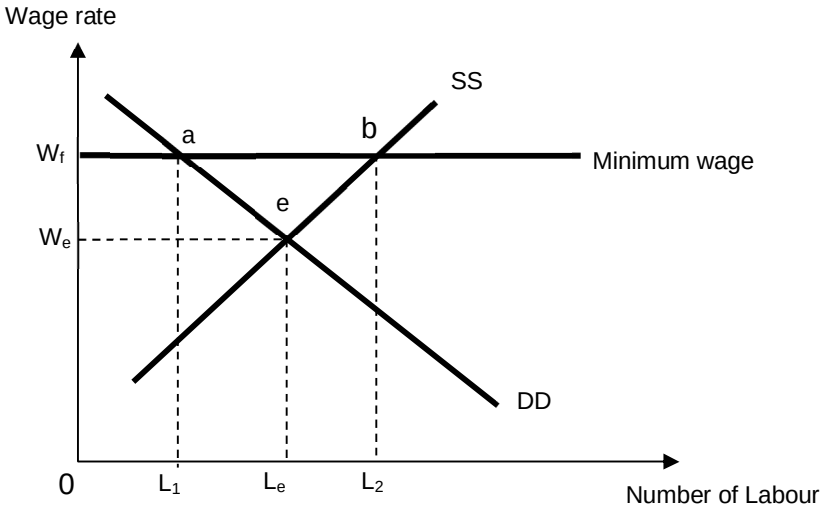


Figure 20: Effects of Minimum Wage Law

An analysis of the effects of a minimum wage law:

1. The wage rate increases from **W_e** to **W_f** (intended consequence).

2. At the initial wage rate of W_e the quantity of labour employed is L_e. With the imposition of minimum wage, the quantity labour employed is L_1 and this results in **unemployment** (unintended consequence).

3. At this higher wage, the number of people who are willing to work increases to L_2 but firms are only willing to employ L_1 of workers. Thus, there is a **surplus** of **L_2L_1** workers, who are unemployed.

4. The extent of unemployment depends on the responsiveness of demand and supply of labour to change in the wage rate and the level at which the minimum wage is set. For example, if the demand for labour is price elastic because firms can easily substitute capital for labour, as is usually the case for unskilled labour, they will retrench more workers. This makes the unemployment problem more severe.

5. The minimum wage law may also cause an increase in the prices of final goods or **cost-push inflation** (unintended consequence)**.** This is because a rise in wages, *ceteris paribus*, increases a firm's cost of producing goods. Firms thus pass the higher labour costs to the consumers by charging a higher price.

Connect, Extend, Challenge

In the News

Singapore should have minimum wage, says economist Lim Chong Yah

Eminent economist and academic Lim Chong Yah is perhaps best known for serving as chairman of the National Wages Council (NWC) for almost three decades. In 2012, he made headlines for suggesting what has been dubbed "wage shock therapy" - hiking the pay of the lowest-paid workers by 50 per cent over a period of three years and a voluntary freeze, for three years, on further pay increases for those earning more than S$1 million per year. His proposals were met with mixed responses. Five years on, he stands by them, and maintains that the Government should consider implementing a minimum wage.

Bharati: Why do you stand by minimum wage considering these other models that have been introduced and the arguments against minimum wage have been spelled out several times by the Singapore Government? That it could increase the cost of production, could negatively impact the economy, it might actually result in a lower rate of employment because companies may fire some workers and divert their wages towards funding the minimum wage for the remaining workers. And it could cause companies to have reduced profits or even go bankrupt? Although several studies have shown that none of this has happened in several countries that have implemented the minimum wage, the Government here maintains there are better options than minimum wage.

Lim: One can discuss the minimum wage issue until kingdom come. There are pros and there are cons. Most nations in the world, developed countries in particular, have introduced the minimum wage system. There were studies showing that with the introduction of the minimum wage, it would not damage the economy, provided the minimum wage level is linked to the national productivity level. In other words, it cannot be too high, neither should it be too low that it becomes irrelevant. In our case, we are very blessed that we have the NWC that can study whether we are going too far in having the minimum wage. If it's say, S$1,000, how many people would be affected? Preferably, the minimum wage should be implemented at a time when there is a booming economy than when there is fear of a slowdown or recession. The timing is important. The quantum, too, is important

Bharati: You say it ought to happen at a time when the economy is good, but what happens if the economy turns bad? The minimum wage may not be sustainable anymore.

Lim: That's why one mustn't put the minimum wage too high. That can create unemployment. These things have to be discussed.

Adapted from https://www.channelnewsasia.com/news/singapore/singapore-should-have-minimum-wage-says-economist-lim-chong-yah-8928862

Do you think Singapore should impose a minimum wage?

3.6 Explaining wage differentials

Assuming a perfectly competitive free labour market, wages in different labour market are not homogenous. Wages are relatively higher in labour markets where the demand for labour is high, and supply of labour is low. Differences in PES and PED of labour also helps to explain wage differentials.

To be a neurosurgeon, one must undergo many years of education and specialised training as compared to an administrative executive. Furthermore, the minimum job entry qualification restricts the supply of neurosurgeons in the market. Hence the supply of neurosurgeons is significantly lower than that of administrative executives. In addition, a special aptitude is needed to be a neurosurgeon hence the supply of neurosurgeons is relatively more price inelastic compared to that of administrative executives.

In addition, the value of PED for labour also differs between these two occupations. Since labour is a derived demand, its PED is determined by that of the product. As the neurosurgery is a definite necessity for the patient who must undergo surgery and the skills of the neurosurgeons is highly demanded for, coupled with a lack of close substitute for the neurosurgeon, the demand for neurosurgeons is relatively more price inelastic than administrative executives.

Due to the above reasons, neurosurgeons will earn a higher wage relative to an administrative executive, $W_0 > W_1$, as illustrated in the Figures 21 and 22 below.

In a perfectly competitive labour market, administrative executives will be attracted by the higher wages in the market for neurosurgeons. This will increase the supply neurosurgeons in the market and drive down wages. However, due to occupational immobility i.e., administrative executives will find it extremely difficult to switch to becoming a neurosurgeon due to the high skills barrier, the wage differential will persist.

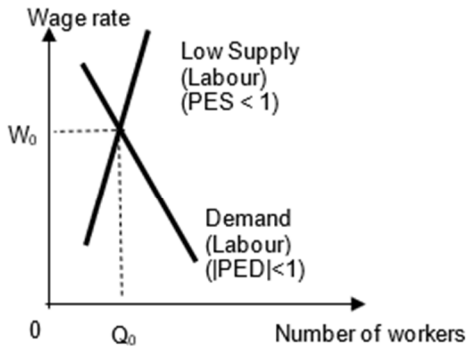


Figure 21: Market for Neurosurgeons

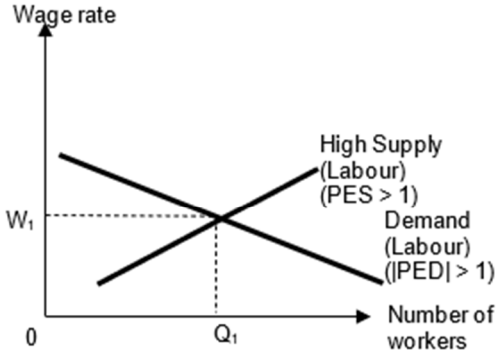


Figure 22: Market for Administrative Executives

Summary

Through this topic, you have uncovered the following **Enduring Understandings:**

1. Governments intervene in markets because they may want to:
   a. Encourage, discourage or even prohibit the production or consumption of a good
   b. Raise revenue
   c. Make certain goods more affordable or
   d. Redistribute income

2. Government intervention in markets can affect the equilibrium price and quantity, consumer expenditure and producer revenue, consumer surplus and producer surplus.

3. Impact of government intervention on markets may be affected by price elasticities of demand and supply.

***Note**: There are other types of government intervention which you will learn more in depth in Topic 5: Microeconomic Objectives and Policies. These policies include direct government provision, legislation and regulations, as well as public education.*

Summary of Government Intervention and Impacts

Type of Policy	Rationale	Impact on Price and Quantity	Impact on Welfare (Consumer Surplus/Producer Surplus/Government Expenditure)	Diagram *(Please complete the diagrams on your own as practice)*
Indirect Tax	• To reduce production /consumption of a good or service (Efficiency) • To increase government tax revenue so as to fund government policies to achieve its micro and macroeconomic objectives	**COP↑ → SS↓ → P↑, Q↓**	*Assuming no market failure:* Fall in CS Fall in PS Increase in government revenue loss in social welfare	
Subsidy	• To increase production /consumption of a good or service (Efficiency) • To ensure affordability of certain goods and services (Equity)	**COP↓ → SS↑ → P↓, Q↑**	*Assuming no market failure:* Increase in CS Increase in PS Increase in government expenditure loss in social welfare	

Type of Policy	Rationale	Impact on Price and Quantity	Impact on Welfare (Consumer Surplus/Producer Surplus/Government Expenditure)	Diagram *(Please complete the diagrams on your own as practice)*
Maximum price (Price ceiling)	• To ensure affordability of certain goods and services (Equity)	If above Pe → No impact on P and Q If below Pe → **P↓, Q↓**	*Assuming no market failure:* Indeterminate impact on CS Fall in PS loss in social welfare	
Minimum price (Price floor)	• To protect producers' total revenue and hence profits, for goods/services that have price inelastic demand (Equity)	If above Pe → **P↑, Q↓** If below Pe → **No impact on P&Q**	*Assuming no market failure:* Fall in CS Indeterminate impact on PS loss in social welfare	

Type of Policy	Rationale	Impact on Price and Quantity	Impact on Welfare (Consumer Surplus/Producer Surplus/Government Expenditure)	Diagram *(Please complete the diagrams on your own as practice)*
Quotas	• To reduce production /consumption of a good or service (Efficiency)	If above Qe → **No impact on P&Q** If below Qe → **P↑, Q↓**	*Assuming no market failure:* Fall in CS Indeterminate impact on PS loss in social welfare	