



ST ANDREW'S JUNIOR COLLEGE

JC1 H1 ECONOMICS 2024

Microeconomic Objectives and Policies

In a market-based economy, the price mechanism is assumed to allocate resources efficiently. In such an ideal model of the economy, firms are assumed to have perfect information and there is perfect factor mobility. In this topic, we will explore how in the real world, markets may not work efficiently because the assumptions of an ideal economy do not hold true. This leads to the failure of the market to allocate resources efficiently. This is termed as 'market failure'. Market failure provides the justification for government intervention in the free market. Learning about market failure will deepen our understanding of real-world complexities, equip us with the tools to analyze and predict the impact that decisions have on firms, industries and the nation. The knowledge, skills and values that we develop will help us to appreciate policies in Singapore to address market failure and encourage us to take an active interest in Singapore's economy as contributing and concerned citizens.



Important concepts and tools of analysis

- ♥ Allocative Efficiency
- ♥ Equity
- ♥ Market Failure
- ♥ Deadweight loss
- ♥ Marginal private benefit and cost
- ♥ Marginal external benefit and cost
- ♥ Marginal social benefit and cost
- ♥ Social versus private (market) optimum
- ♥ Public goods – Non-excludability and non-rivalry
- ♥ Information Failure



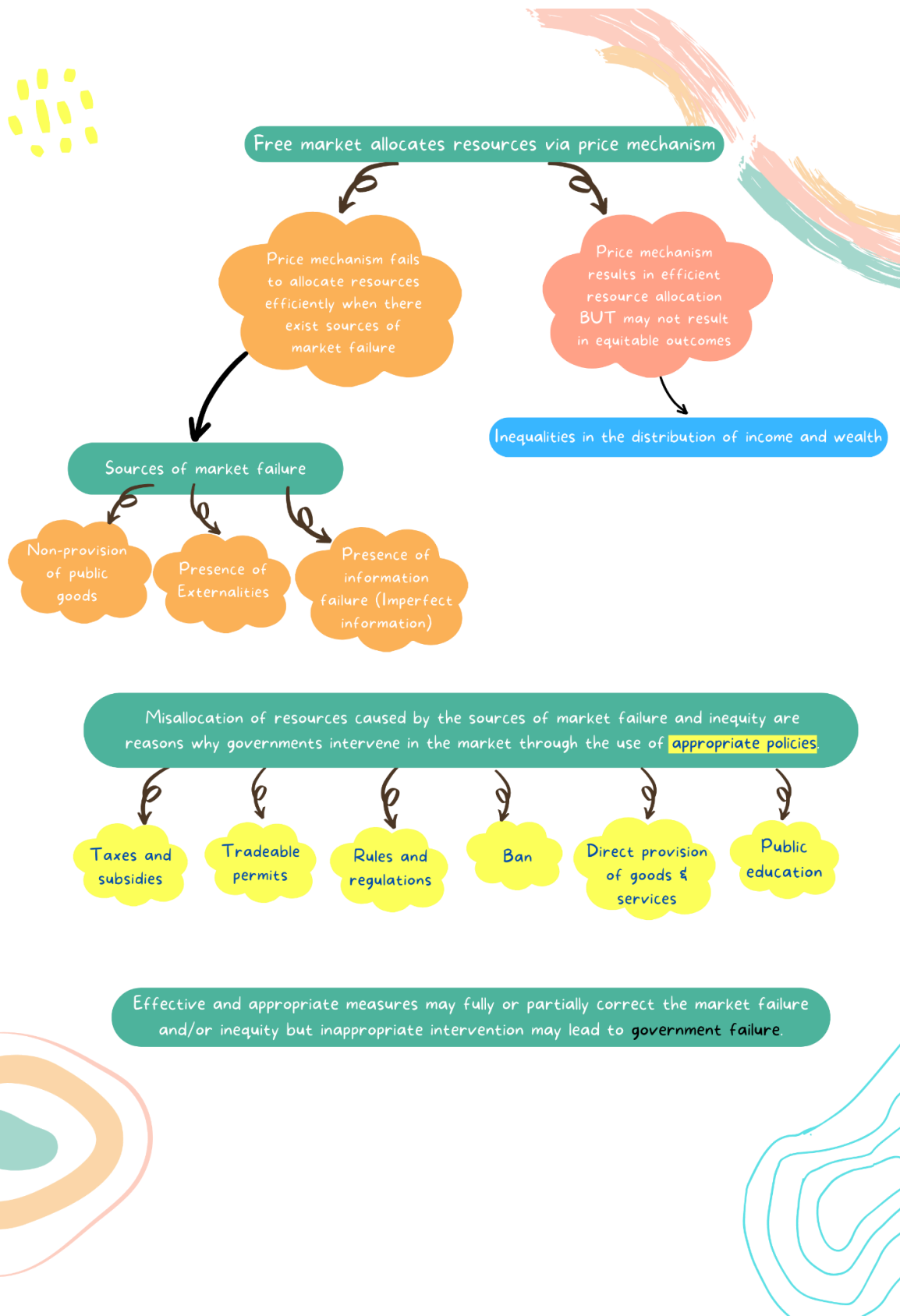
Key questions to consider

1. What are the microeconomic objectives of the government?
2. What is market failure?
3. What are the sources of market failure?
4. How does the presence of externalities lead to market failure?
5. How does the presence of information failure lead to market failure?
6. How does the non-provision of public goods lead to market failure?
7. What can the government do to deal with market failure?
8. How does the lack of equity lead to a distributional issue?
9. What are the causes of inequity?
10. What can the government do to deal with inequity?
11. What causes government failure?

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Concept Map





1. INTRODUCTION

Due to the problem of scarcity, all economies are faced with **three basic questions of resource allocation**:

- i. What to produce?
- ii. How to produce
- iii. For whom to produce?



Recall

“What to produce?” affects whether **an optimal amount of a good/service is being produced/provided** and hence the **objective of allocative efficiency**.

“How to produce?” affects whether **the most cost-efficient method of production is being used** and hence the **objective of productive efficiency**.

Lastly, **“for whom to produce?”** affects **how the goods are being distributed** and hence the **objective of equitable distribution of income and wealth**.

The free market uses the price mechanism (which is the interaction of demand and supply) to achieve an efficient allocation of resources. Proponents of the free market often argue that the free market mechanism is the best way to allocate resources. However, there are times when it can fail to achieve the objectives of efficiency (both allocative and productive efficiency) due to different sources of market failures.

At times, there may even be trade-offs between efficiency and equity. The equilibrium price determined by the price mechanism may be too high for some segments of the society (e.g., low-income families) such that they are not able to consume that particular good/service. The notion of equity becomes more important if the good/service concerned is an essential one e.g., healthcare.

Thus, the government needs to intervene in the working of the free market to achieve the two main microeconomic goals of government of **efficient allocation of resources** and **equitable distribution of income and wealth** in the economy.



Key Question 1: What are the microeconomic objectives of the government?

2. GOVERNMENTS' MICROECONOMIC OBJECTIVES

2.1. Efficiency

A society is considered to have achieved efficiency when it is **able to achieve both allocative efficiency as well as productive efficiency** in the use of resources.

Allocative efficiency: A situation where **resources are allocated in a manner** to produce the **combination of goods and services most wanted by society**, therefore, **maximising its welfare**.

Productive efficiency¹: A situation where **firms are producing the maximum output for a given amount of inputs**, or where **firms are producing a given output at the least cost**.

Recap: Concept of Market Equilibrium in a Free Market

The price mechanism in a free-market signals and directs resources to the production of goods and services which consumers want (consumer sovereignty). Assuming the conditions² for the free market economy to function holds true, the price mechanism ensures efficient allocation of resources as it results in the maximum welfare for society i.e., **the sum** of producer surplus and consumer surplus is maximised.

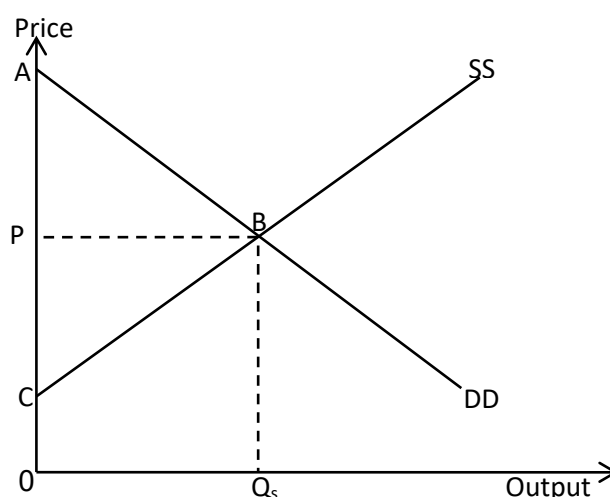


Figure 1: Market Equilibrium

¹ Productive efficiency will be covered in the next topic – Firms and Decisions.

² The conditions for free market economy to ensure efficient allocation of resources are found on the next page.



The market equilibrium occurs at point B where quantity demanded is equal to quantity supplied. Resources are said to be allocated efficiently at the equilibrium output of OQ_s at price OP . At this market equilibrium, the **sum** of consumer surplus (PAB) and producer surplus (PBC) is maximised. There is no welfare loss when this occurs.

Assumptions of Free Market

While the price mechanism in a free market ensures efficient allocation of resources, it functions based on the following assumptions:

- 1) **Economic agents are rational** – Consumers and producers always make rational decisions when purchasing or producing goods and services.
- 2) **Consumers possess perfect information** – they know all options, prices, and quality. In other words, the consumers are well-informed.
- 3) **Perfect competition exists** – there are many producers competing with each other. There is no single supplier who is large enough to control the supply in order to significantly affect the price. Prices are set by supply & demand.
- 4) **No third party costs or benefits i.e., no externality** - Production and consumption of the good or service does not affect third parties who are not involved in the transaction.
- 5) **Perfect mobility of factors of production** – labour, capital, entrepreneurship and land can be transferred from the production of one good to another easily.
- 6) There is **no government intervention**.

If any one of the above assumptions do not hold true, the free market will fail in ensuring efficient allocation of resources.



Allocative Efficiency in a Free Market

Allocative Efficiency is achieved when **resources are allocated in a manner** to produce the **combination of goods and services** most wanted by society, therefore maximising its welfare.

Efficiency in markets occurs when the social optimum is achieved, where **Marginal Social Benefit (MSB) = Marginal Social Cost (MSC)**, maximising society's welfare, i.e., the outcome is allocative efficient.

MSB is the value of the additional benefit that society places on the consumption or production of **an additional** unit of a good.

MSC on the other hand, is the value of the additional cost of using society's resources to consume or produce **that additional** unit of the good.

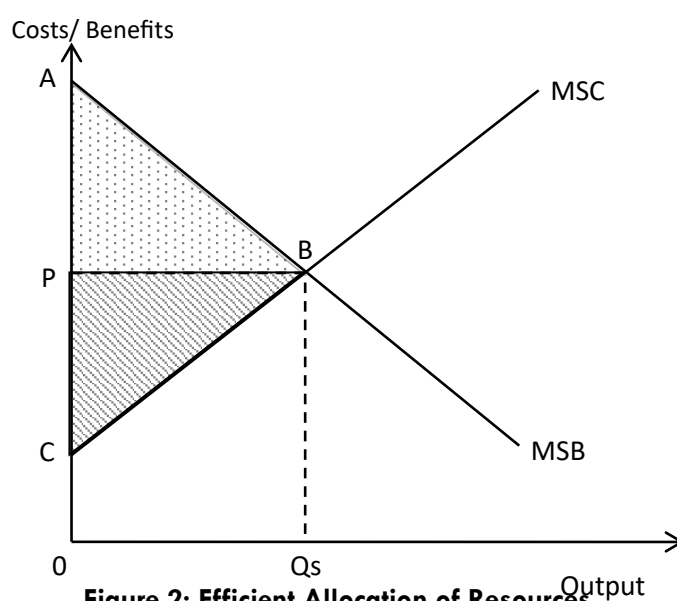


Figure 2: Efficient Allocation of Resources

In Figure 2 above, at the output level where $MSB = MSC$, i.e., $0Q_s$, society's valuation of the benefit arising from the consumption or production of an additional unit of the good is exactly equal to the valuation of the cost of using society's resources to consume or produce that additional unit of the good. Thus, society's consumption or production of $0Q_s$ units of output has achieved the maximum net benefit³ as shown by area ABC which is the **sum of** area PAB (consumer surplus) and PBC (producer surplus).

This means that the allocation of resources is at its optimal at $0Q_s$ as society's welfare is maximised. Resources are said to be allocated efficiently when $0Q_s$ is produced.

³ net benefit = benefit – cost



Recap: Productive Efficiency and the PPC

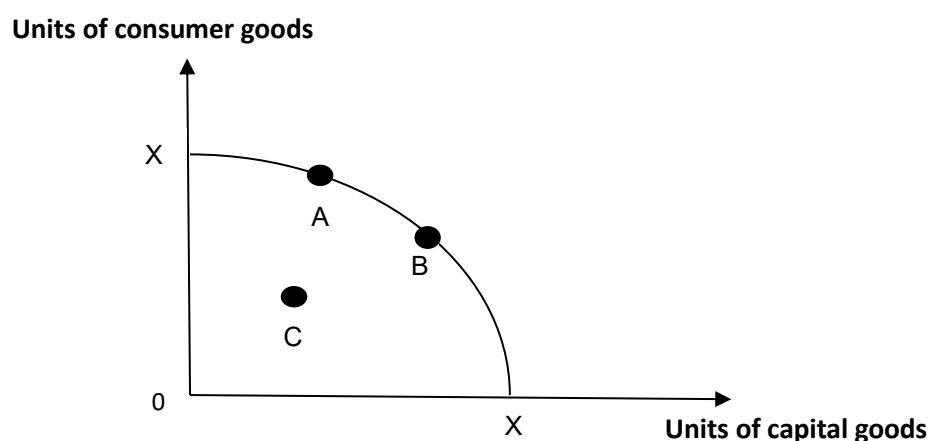


Figure 3: Productive Efficiency illustrated on a PPC

Productive efficiency occurs when a firm is producing its output at the lowest cost possible. For an economy to operate on its production possibility curve, it must utilise all its resources efficiently. If the economy produces any output combinations that lie on the production possibility curve, such as Point A and Point B, the economy is said to be productively efficient.

However, if the economy is operating inside the PPC, such as Point C, some resources are under-employed or unemployed and the economy is said to be inefficient.

Out of all the points on the production possibility curve, only one point is allocative efficient. A society can achieve allocative efficiency only when it is productively efficient.

2.2. Equity

Equity is a normative concept. This means that it concerns itself with value judgments and statements of "what ought to be," rather than facts based on cause-and-effect statements. Equity is inherently subjective as different economic agents in a society may have different perceptions as to what is considered fair.

Equity is concerned with how resources are distributed throughout society. An equitable distribution of income or resources occurs when there is fairness in the distribution of essential goods and services. Lower prices and increased accessibility to goods like education, healthcare, housing, transportation, food and utilities should in general translate to more equitable outcomes. Similarly, transfers of income and wealth from higher to lower income households should also translate to more equitable outcomes.

Note: Inequity is a distributional issue and not considered a market failure.



There are three main types of economic inequality:

1. Income Inequality

Income inequality is the extent to which income is distributed unevenly in a group of people. Income is not just a person's salary, but all the money received from employment (wages, bonuses etc.), investments, such as interest on savings accounts and dividends from shares of stock, savings, state benefits (unemployment benefits and other transfer payments), pensions (state, personal, company) and rent.

Distribution of income can be measured in 2 ways:

- i. **Size distribution of income:** measures distribution of income between households or individuals. Usually measured by Gini coefficient which takes values from 0 (perfect equality) to 1 (perfect inequality)
- ii. **Functional distribution of income:** measures distribution of income between different factors of production e.g., distribution of income between consumers and firms can be measured by the level of profits in the LR.

2. Wage Inequality

A person's wage is different from their income. Wage refers to payment from employment only. This can be on an hourly, monthly or annual basis, is typically paid weekly or monthly and may also include bonuses. Wage inequality therefore describes the difference between people's wages.

3. Wealth Inequality

Wealth refers to the total amount of assets of an individual or household. This may include financial assets, such as bonds and stocks, property and private pension rights. Wealth inequality therefore refers to the unequal distribution of assets in a group of people.



Key Question 2: What is market failure?

Key Question 3: What are the sources of market failure?

3. MARKET FAILURE

Market failure occurs when the free market is unable to allocate resources efficiently.

The free market may not provide the right mix of goods or the optimal amount of a particular good. As a result, the market is not allocating resources efficiently and society's welfare is not maximized.

Left to the free working of the price mechanism and assuming that the economy is a perfectly competitive market with no externalities, the resulting equilibrium in the economy will be economically efficient. Adam Smith stressed that the “invisible hand” leads people with self-interest to act in such a way that promotes overall welfare for the economy.

However, in actual fact, the market economy does not always achieve optimal allocation of resources as the assumptions stated in Section 2.1 do not hold in the real world. If these assumptions of free market economy do not hold true, there could be distortions of the free-market mechanism that leads to market failure. Hence, due to breaking down of the assumptions, market failure can arise due to the following causes:

- Non-socially optimal levels of goods and services being produced or consumed due to:
 - Presence of externalities
 - Presence of information failure (imperfect information)
 - Non-provision of public goods

Complete Market Failure

A complete market failure exists when free markets are unable to allocate scarce resources to the satisfaction of a need or want. This occurs because there are insufficient incentives to encourage profit-seeking firms to enter a market (missing markets).

Partial Market Failure

A partial market failure exists the price mechanism allocates some resources to the production of the good but not at the socially efficient output level.



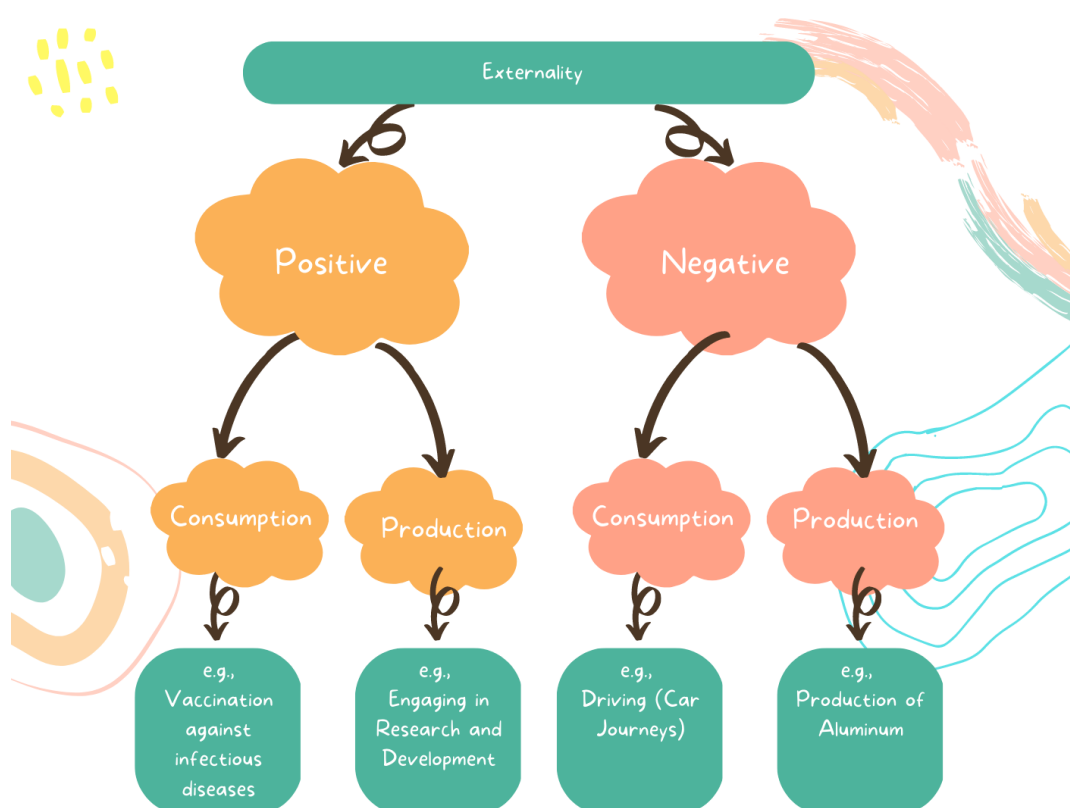
Key Question 4: How does the presence of externalities lead to market failure?

3.1. Presence of Externalities and Government Intervention

Definition: An externality is a benefit or cost arising from the production/consumption of a good or service that falls on a third party and is not taken into account by the producers or consumers of the good.

This is sometimes referred to as “spillover”/ “third party” benefits or costs

Externalities can be positive or negative and can occur in production or consumption.



We shall further examine the definitions of key terms used in this section.

- Marginal Private Benefit (MPB)** is the additional benefit enjoyed by individual persons/firms from the production or consumption of an additional unit of the good or service.
- Marginal Private Cost (MPC)** is the additional cost incurred by individual persons/firms in the production or consumption of an additional unit of the good or service.
- Marginal External Benefit (MEB)** can be defined as the additional benefit enjoyed by / accorded to third parties not involved in the economic transaction when an additional unit of the good is produced/consumed.



d) **Marginal External Cost (MEC)** can be defined as the additional cost borne by third parties not involved in the economic transaction when an additional unit of the good is produced/consumed.

e) **Marginal Social Benefit (MSB)** is the additional benefit enjoyed by the society in the production or consumption of an additional unit of a good or service.

It is the sum of the marginal private benefit (MPB) and marginal external benefit (MEB).

$$MSB = MPB + MEB$$

f) **Marginal Social Cost (MSC)** is the additional cost incurred by the society in the production or consumption of an additional unit of good or service.

It is the sum of the marginal private cost (MPC) and marginal external cost (MEC).

$$MSC = MPC + MEC$$

Resource Allocation in the absence of externalities

As mentioned earlier, allocative efficiency occurs when $MSB = MSC$.

In Figure 4, assuming there are no external costs or benefits, $MSB = MPB$ and $MSC = MPC$. Thus, the socially optimal equilibrium occurs at point B where $MSB = MSC$ and the socially optimal output level is at OQ. At this level of output, resources are efficiently allocated to the production and consumption of the good and society's welfare is maximised.

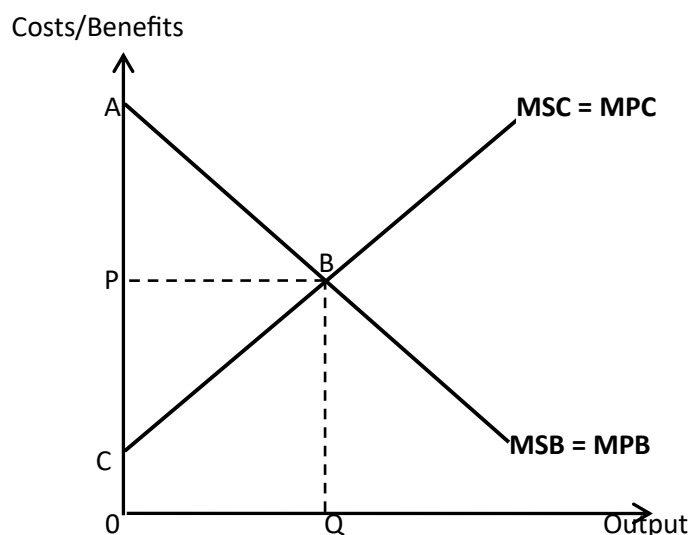


Figure 4: Socially Optimal Equilibrium

In reality, in the pursuit of self-interest, producers and consumers would only consider their private costs and private benefits. They do not take into account costs or benefits incurred on third parties (negative and positive externalities respectively) in their decision-making process.



In the production or consumption of a good or service, there can be positive or negative externalities that arise. There is positive externality when external benefits are generated. When external costs are incurred, we say there is a negative externality.

We shall now examine two cases of how the presence of externalities can lead to market failure:

i. Positive externalities in

- **Consumption e.g., vaccination against infectious disease**
- **Production e.g., engaging in research and development**

ii. Negative externalities in

- **Consumption e.g., driving**
- **Production e.g., production of aluminium**

In such a situation where externalities are present, the free market will fail to allocate resources efficiently and therefore, the socially optimal output, OQ , as shown in Fig. 4 would not be produced. We say that there is a market failure.

Some examples of negative externalities

Event	Private Costs	Private Benefits	External costs and third parties involved
British Petroleum oil spill in Louisiana Coast	<i>Cost of refining the oil and cost of shipping the oil along the coast</i>	<i>Revenue earned from selling the petroleum oil</i>	<i>Adverse effects on the livelihood of fishermen in the area.</i> <i>Adverse effects on the health of the residents who consume food from the ocean.</i> <i>Tourism in Florida was adversely affected.</i> <i>Damage to ecological environment.</i>
Vuvuzela used during the South Africa World Cup 2010	<i>Costs of purchasing the vuvuzela</i>	<i>Enjoyment and fun experienced while using the vuvuzela while spectating the game</i>	<i>Noise pollution and risk of hearing impairment for other spectators.</i>
Dumping of toxic factory waste into the river	<i>Cost of producing the industrial product e.g., steel</i>	<i>Revenue earned from selling the industrial product</i>	<i>Adverse effects on the health of the residents who consume food from the river.</i> <i>Damage to ecological environment.</i> <i>Costs of cleaning up the river borne by the government</i>

*Adapted from Curriculum Planning and Development Division,
MOE Singapore in collaboration with LTA, 2010*



3.1.1. Negative Externalities in Consumption

Negative externalities in consumption occur when external costs are imposed on third parties from the consumption of a good or service by private individuals. For example, the consumption of car journeys (driving) generates negative externalities in consumption because it contributes to traffic congestion.

Hence, driving results in external costs to third parties (non-drivers) who are affected by traffic jams. This has implications on the nation's productivity and affects the standard of living of the residents in the nation.

Costs/Benefits of car journeys

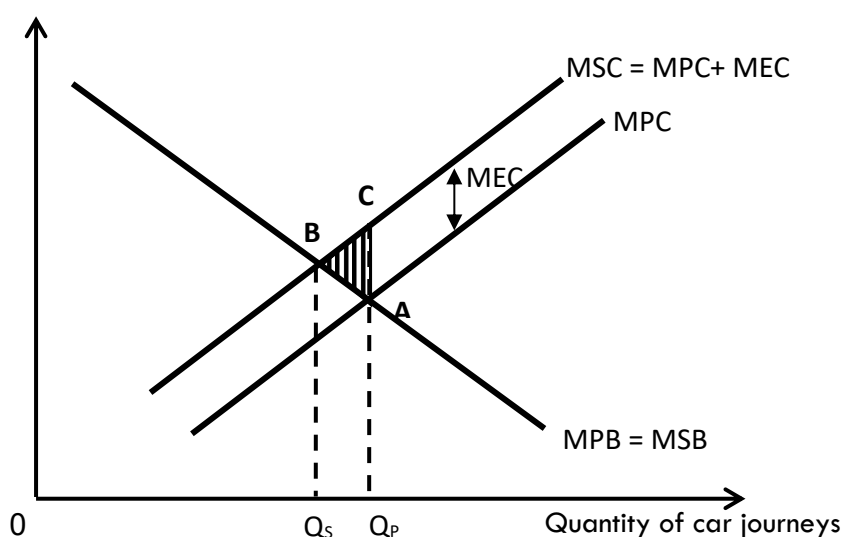


Figure 5: Negative externalities in consumption

In Figure 5 above, MPB is the value of the additional benefit that a driver places on an additional car journey in terms of the ease, convenience and time saved in commuting from one place to another.

MPC measures the additional cost of an additional car journey to the driver such as cost of fuel, time and maintenance costs.

Motivated by self-interest, individuals will only consider their Marginal Private Benefit (MPB) and Marginal Private Cost (MPC) of car journeys instead of the Marginal Social Benefit (MSB) and Marginal Social Cost (MSC).

However, when the roads get too crowded, it causes delay to other road users who are caught in the traffic congestion. These can include office workers, students and even ambulances and other emergency services like fire engines. The delay may be costly in terms of loss of productivity (wasted time), lives and property. These are external costs that are borne by others.

Therefore, a negative externality in consumption leads to a divergence⁴ between MSC and MPC as represented in Figure 5, where $MSC (MPC + MEC) > MPC$.

⁴ A divergence is seen here represented by the difference between marginal social cost and marginal private cost. The 2 sets of curves can be drawn either parallel or non-parallel. When the 2 sets of curves are drawn parallel, it assumes that MEC remains constant at all output levels though this may not necessarily hold true in the real world.

TIPS

Figure 5 shows **negative externalities in consumption.**

Please label the **y-axis costs/benefits** of e.g., car journeys and **x-axis as quantity of** e.g., car journeys according to the context.



In this case, the price mechanism fails to bring about a socially efficient allocation of resources. The cost to the third parties is not captured by the price mechanism. Due to the presence of MEC, $MSC (=MPC+MEC) > MPC$. Thus, what the consumer pays is not equal to what the society has to pay.

The free-market equilibrium level of consumption occurs at OQ_P in Figure 5 when consumers, motivated by self-interest, equate their marginal private benefits and marginal private cost i.e., $MPB=MPC$.

However, due to the existence of negative externalities caused by traffic jams, the marginal social cost of consumption is higher than the marginal private cost.

Assuming there are no positive externalities, $MPB=MSB$.

The socially optimal equilibrium occurs when $MSB=MSC$ at OQ_S .

The market equilibrium quantity OQ_P is more than the socially optimal quantity OQ_S .

From society's point of view, fewer car journeys should have been taken to attain the socially optimal level of consumption. This means that there is an overconsumption of car journeys. As shown in Figure 5, the good has been over-consumed by Q_SQ_P units. The over-consumption of Q_SQ_P created a social cost of Q_SBCQ_P but a social benefit of only Q_SBAQ_P .

This results in a deadweight loss of ABC for society. To maximise society's welfare, the quantity consumed should decrease to OQ_S because for all units from Q_S to Q_P , the society incurs a higher cost than what society values the benefits as. Hence, there is an over-allocation of resources to the consumption of this good. Fewer resources should be allocated to achieve allocative efficiency.



How Negative Externalities in Consumption Lead to Market Failure

<u>Step 1</u> Identify source of market failure	Negative externalities in consumption occur when external costs are imposed on third parties from the consumption of a good or service by private individuals.
<u>Step 2</u> Explain divergence	<p>In the consumption of car journeys, a driver incurs private costs such as cost of fuel while enjoying private benefits such as convenience and time saved commuting from one place to another.</p> <p>The consumption of car journeys (driving) generates negative externalities in consumption because it contributes to traffic congestion as third parties will incur loss of productivity due to time spent stuck in traffic.</p> <p>The presence of external cost ($MEC > 0$) leads to a divergence between MPC and MSC. Marginal social cost (MSC) is higher than the marginal private cost (MPC).</p>
<u>Step 3</u> State assumptions	Assuming no positive externalities ($MEB=0$), $MPB = MSB$
<u>Step 4</u> Identify free market equilibrium (Q_p)	The free-market equilibrium level of consumption occurs at $0Q_p$ in Figure 5 when consumers, motivated by self-interest, equate their marginal private benefits and marginal private cost i.e., $MPB=MPC$.
<u>Step 5</u> Identify social equilibrium (Q_s)	The socially optimal equilibrium, where societal welfare is maximised occurs when $MSB=MSC$ at $0Q_s$.
<u>Step 6</u> Compare Q_p & Q_s	The market equilibrium quantity $0Q_p$ is more than the socially optimal quantity $0Q_s$.
<u>Step 7</u> Identify area of DWL and link to market failure	<p>From society's point of view, fewer car journeys should have been taken to attain the socially optimal level of consumption. This means that there is an overconsumption of car journeys. As shown in Figure 5, the good has been over-consumed by Q_sQ_p units. The over-consumption of Q_sQ_p created a social cost of Q_sBCQ_p but a social benefit of only Q_sBAQ_p.</p> <p>Since social costs (Q_sBCQ_p) > social benefits (Q_sBAQ_p) for the amount over-consumed. This results in a deadweight loss of ABC for society. To increase society's welfare, the level of consumption should decrease to $0Q_s$. To achieve allocative efficiency, fewer resources should be allocated to the consumption of this good.</p>



3.1.2. Negative Externalities in Production

Negative externalities in production occurs when external costs are imposed on third parties from the production of a good or service. An example of an activity that generates negative externalities in production is in the production of aluminium. Assuming that the production of aluminium contributes to air pollution, this would impose costs on third parties such as residents who live nearby the aluminium factory and who are not involved in the production of aluminium. These residents would be adversely affected by the production of aluminium as long-term exposure to the harmful toxic fumes passed out in the production of aluminium would lead to them incurring healthcare costs.

The aluminium manufacturer, who aims to maximise his profits will base his output decision on his Marginal Private Benefit (MPB) and Marginal Private Cost (MPC) instead of Marginal Social Benefit (MSB) and Marginal Social Cost (MSC).

This is because MPC reflects the additional costs directly incurred by him, i.e., additional cost of raw materials to produce an additional unit of aluminium and MPB reflects the additional benefits directly accruing to him in producing an additional unit of aluminium, i.e., additional revenue earned from selling an additional unit of aluminium.

In this case, assuming a perfectly competitive market, the MPB is effectively the demand curve while the MPC is effectively the supply curve.

Costs/Benefits of producing aluminium

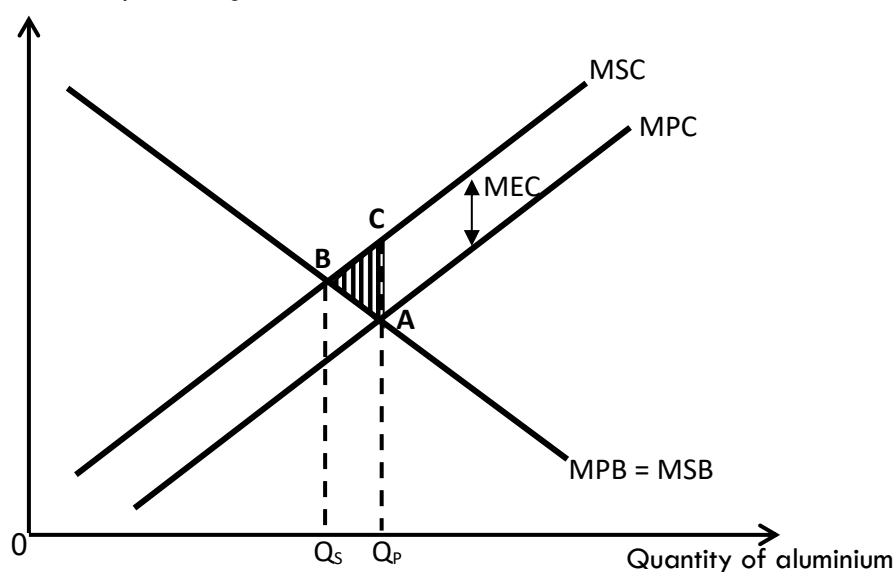


Figure 6: Negative externalities in production

When negative cost on third parties is generated, $MSC > MPC$ since $MSC = MPC + MEC$ as represented in Figure 6. In this case, the price mechanism fails to bring about a socially efficient allocation of resources as the cost to third parties is not priced by the price mechanism. Hence, it is not included in the marginal private costs (MPC) of producers.

Due to the presence of MEC, $MSC > MPC$. Thus, the producers' cost is less than the cost that society has to bear. We assume that $MPB = MSB$, i.e., there is no positive externality.

The market equilibrium level of production occurs at OQ_P in Figure 6 when producers, motivated by self-interest, equate their marginal private benefits and marginal private cost i.e., $MPB = MPC$.



However, the marginal social cost of production (MSC) is higher than the marginal private cost (MPC) due to the existence of negative externalities.

The socially optimal equilibrium occurs when these negative externalities are taken into account i.e., when $MSB=MSC$ at $0Q_s$.

The market equilibrium quantity $0Q_p$ is more than the socially optimal quantity $0Q_s$. Therefore, from society's point of view, the good is over-produced by Q_sQ_p units.

The over-production created a social cost of Q_sBCQ_p but a social benefit of only Q_sBAQ_p , leading to a deadweight loss of ABC for the society. To maximise society's welfare, the quantity produced should decrease to $0Q_s$ because for all units from Q_s to Q_p , the society incurs a higher cost than what the society values the benefits as. Hence, there is an over-allocation of resources to the production of this good. Fewer resources should be allocated to achieve allocative efficiency.

How Negative Externalities in Production Lead to Market Failure

<u>Step 1</u> Identify source of market failure	
<u>Step 2</u> Explain divergence	
<u>Step 3</u> State assumptions	
<u>Step 4</u> Identify free market equilibrium (Q_p)	
<u>Step 5</u> Identify social equilibrium (Q_s)	
<u>Step 6</u> Compare Q_p & Q_s	
<u>Step 7</u> Identify area of DWL and link to market failure	

TIPS

Try filling up the table on your own and see if you are able to complete it



How would questions that require you to make use of this understanding look like?

Have a look at the following question.

This question corresponds to **Sect A Qn 1 & 2** of your Microeconomic Objectives and Policies Tutorial package.

Section A CSQ 1

- (i) Explain negative externalities in consumption and production using examples. [4]

Section A CSQ 2

- (di) Using Extract 3, explain how the use of fertilisers in agriculture leads to market failure. [6]



Key Question 7: What can the government do to deal with market failure?

3.1.3. Government Intervention to Deal with Negative Externalities

In the case of negative externalities in production or consumption, resources are excessively allocated to the production of the good such that the good is over-produced or over-consumed. Figure 7 shows that there is over-consumption/over-production of the good by $Q_S Q_P$ due to the negative externalities in consumption/production. Therefore, some forms of intervention are needed to reduce consumption/production from $0Q_P$ units to $0Q_S$ units.

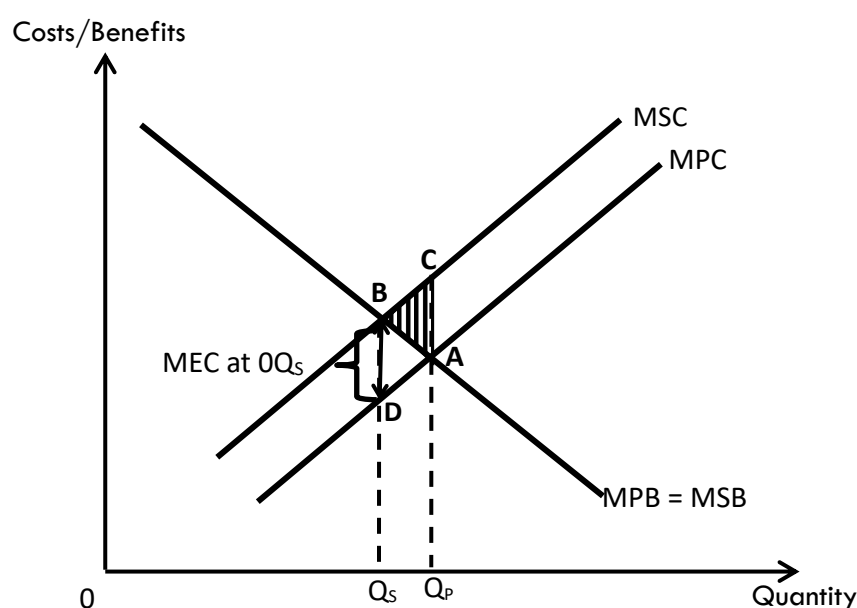


Figure 7: Negative Externality in Production/ Consumption



a) Tax Policy

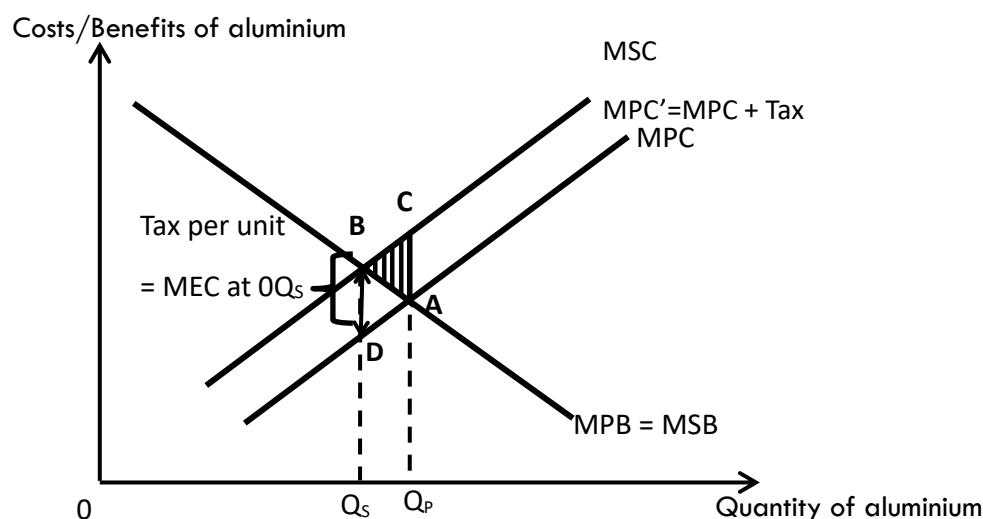


Figure 8: Socially optimal outcome achieved after imposition of tax

How does the tax policy work?

The government can levy a per unit tax equivalent to the monetary value of the marginal external cost (MEC) at the socially optimal output level (OQ_s). This is the monetary valuation of the costs imposed on society due to the negative externality generated from the production or consumption of the good or service.

Tax policy to address negative externalities in production

In the case of the over-production of aluminium, consider a tax per unit equal to the MEC at OQ_s . This corresponds to BD in Figure 8. When such a tax is imposed by the government, it has the same effect as an increase in the cost of production for the aluminium producer. MPC is therefore raised to MPC' as the aluminium producer is forced to internalise the external cost that he generates ($MPC' = MPC + MEC$).

In other words, with the tax per unit that is equal to MEC at OQ_s , the producer now has to factor in the external cost as part of his costs. As a result, the producer will respond by reducing the output level to OQ_s units as he seeks to equate MPC' ($MPC + Tax$) which coincides with the MSC and $MPB (=MSB)$. Hence, socially optimal level of production, OQ_s , is achieved now that $MSC = MSB$.

Tax policy to address negative externalities in consumption

Similarly, a tax per unit equal to the MEC at OQ_s can also be considered to address the over-consumption of car journeys so as to reduce car congestion. Singapore's Electronic Road Pricing (ERP) is an example of a tax on car usage. An ERP tax per unit of car journey is imposed on congested roads to regulate traffic flow during peak hours. When such a tax is imposed by the government, it has the same effect as an increase in the cost of car journeys for the driver. MPC is therefore raised to MPC' as the driver is forced to internalise the external cost that he generates ($MPC' = MPC + MEC$).

In other words, with the tax per unit that is equal to MEC at OQ_s , the driver now has to factor in the external cost as part of his costs. As a result, the driver will respond by reducing the output level to OQ_s units as he seeks to equate MPC' ($MPC + Tax$) which coincides with the MSC and $MPB (=MSB)$. Hence, socially optimal level of consumption, OQ_s , is achieved now that $MSC = MSB$.

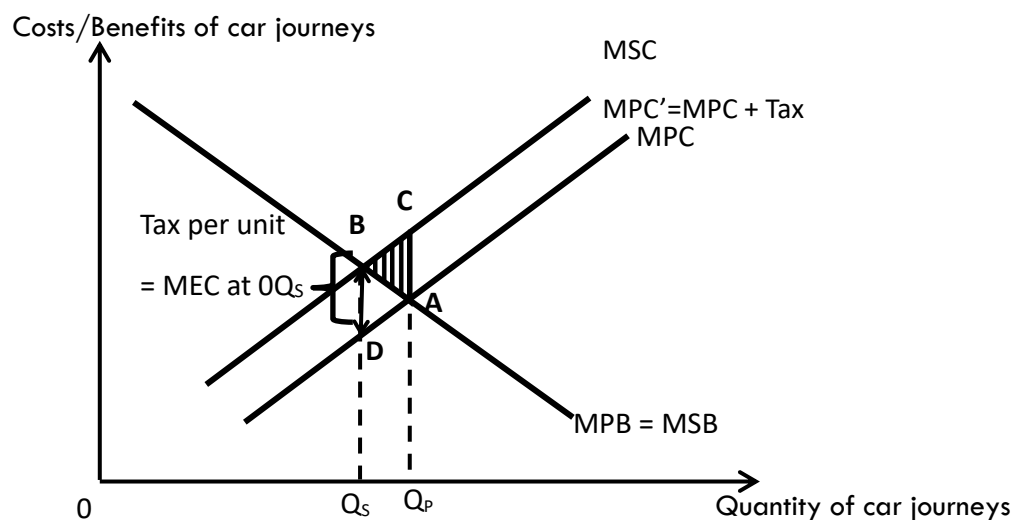


Figure 9: Socially optimal outcome achieved after imposition of tax

Advantages of Tax Policy

Ideally, with the imposition of a tax per unit equal to the MEC at $0Q_S$, the problem of over-consumption or production by the society and deadweight loss is completely eliminated. The policy implementation is relatively easy as not much monitoring is required. In addition, the tax revenue collected can be used to finance government projects such as public education programmes.

Furthermore, people tend to avoid losses. This is a form of cognitive bias known as loss aversion. If the government wants to reduce the use of plastic bags to protect the environment, taxing the use of plastic bags is likely to be more effective than providing equivalent subsidies or discounts for using alternatives such as paper bags.



Limitations of Tax Policy

Indirect taxes may be seen as inequitable as they are regressive in nature.

In the case of the over-production of aluminium, the imposition of tax may not be deemed equitable especially if a larger burden of the tax can be passed on to consumers from the producer.

While the tax per unit imposed to address over-consumption of car journeys such as Singapore's ERP is based on a pay-as-you-use system, the tax could still be deemed as inequitable in the perspective of low-income drivers as the tax is still regressive in nature and takes up a larger proportion of low-income drivers' income.

Furthermore, to achieve allocative efficiency, the government would require accurate and complete information (perfect information) on the value of the external costs imposed on society. However, in reality, the amount of tax imposed in order to achieve the socially efficient level of output is difficult to estimate. When MEC is over-valued, this would lead to a case where output is reduced to a level below social optimum. On the other hand, when MEC is under-valued, this would lead to a case where output is above the social optimum level.

Additionally, the value of the price elasticity of demand (PED) of the good/ service could be a constraint. This is so when the demand for the good/service is price inelastic and a large amount of tax must be imposed in order to bring about the desired change in consumption level. This would typically apply in the case of addictive goods such as alcohol and cigarettes.

Lastly, when seeking to address negative externalities associated with the overconsumption of car journeys, it is useful to note that high COE prices and car taxes substantially raise the costs of owning a car in Singapore. To better spread the high fixed costs of owning a car over its lifespan, drivers in Singapore tend to utilise their cars more often. This lowers the price elasticity of demand for car usage, thus making drivers less responsive to a rise in ERP rates. This may then reduce the effectiveness of road pricing as a measure to control road usage and hence traffic congestion. This is an example of sunk cost fallacy.

TIPS

While the deadweight loss may not be fully eliminated when the tax is not equal to MEC at OQS.

The outcome would still be better than if there was no government intervention at all as the production level would be closer to the socially optimal level.



b) Quota

How does quota work?

In the case of negative externality in production or consumption, the government can place a legal limit on the amount of goods produced or consumed so that output is restricted to the socially optimal level at Q_s .

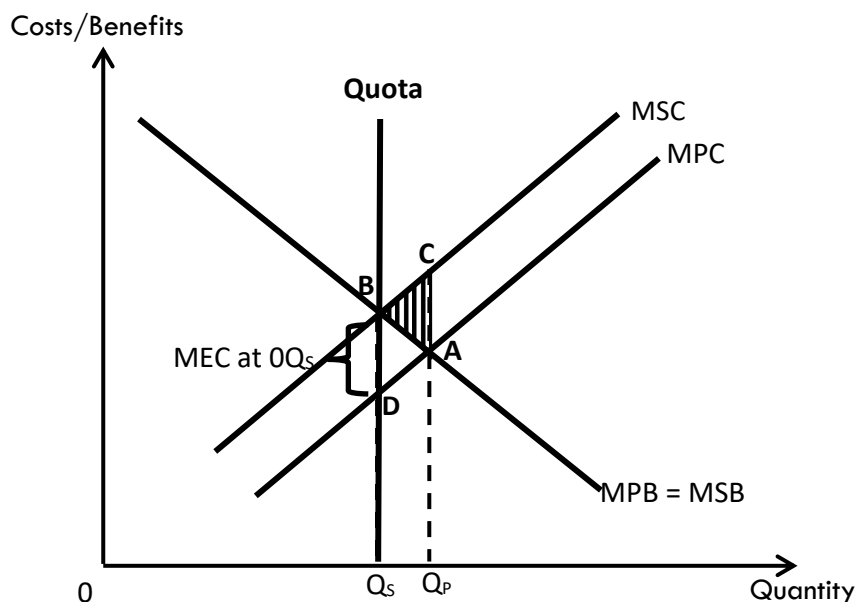


Figure 7: Negative Externality in Production/ Consumption (reproduced)

Quota to address negative externalities in production

In the case of over-production of aluminium, due to the negative externalities generated in production, the government can limit production of aluminium to the socially optimal level, where $MSB=MSC$ at Q_s . Assuming that the government has perfect information on where Q_s is, this would lead to the elimination of the deadweight loss of area ABC as shown in the diagram above.

Quota to address negative externalities in consumption

In the case of over-consumption of car-journeys, the Certificate of Entitlement (COE) system is used to tackle the issue of car ownership in Singapore. This is a form of quota as it limits the growth of vehicle population in Singapore. By limiting car ownership, the government aims to reduce the number of cars on the road, which should reduce traffic congestion in Singapore.

Assuming perfect information, the government can limit the number of COEs to the socially optimal level, where $MSB=MSC$ at Q_s so that the deadweight loss of area ABC would be eliminated.

Advantages of Quota

This is a direct approach that ensures strict compliance by individuals. Once the quota is implemented, it is easy for government to control the number of goods and services produced or consumed.

It also results in greater certainty in achieving its targeted output level compared to other policies like taxes.

TIPS

COE system

is used to tackle the issue of **car ownership**

in

Singapore

while the **ERP system**

is used to tackle the issue of **car usage in Singapore**.



Limitations of Quota

In the case of negative externalities in production, there is no incentive for firms to reduce output any further to cut pollution beyond the legally required limit. It may discourage the adoption of new technology.

Furthermore, it imposes high monitoring costs on the government as it is difficult and costly to ensure compliance. Both time as well as manpower would be required to conduct these regular checks to ensure compliance and this can prove to be costly for the government.

In the case of negative externalities generated from the consumption of car journeys, the root of the problem is associated with car usage and not due to car ownership. The use of the quota system (COE) may not adequately and directly address the problem as it targets only car ownership. In fact, with COE deemed as a sunk cost⁵, drivers may be more likely to drive more.

c) Total Ban

How does a total ban work?

The government may consider other measures to restrict consumption or production levels to 0Qs. However, if all other measures fail to reduce consumption or production levels, a total ban may be a more direct and cost-effective method.

A **total ban** is a straight-forward method to deal with goods that generate huge negative externalities. Some goods incur very huge welfare loss when produced/consumed such that it could be better that the society do without it. For example, narcotics such as Ecstasy and Heroin, when consumed, would incur an external cost to the society and hence welfare loss.

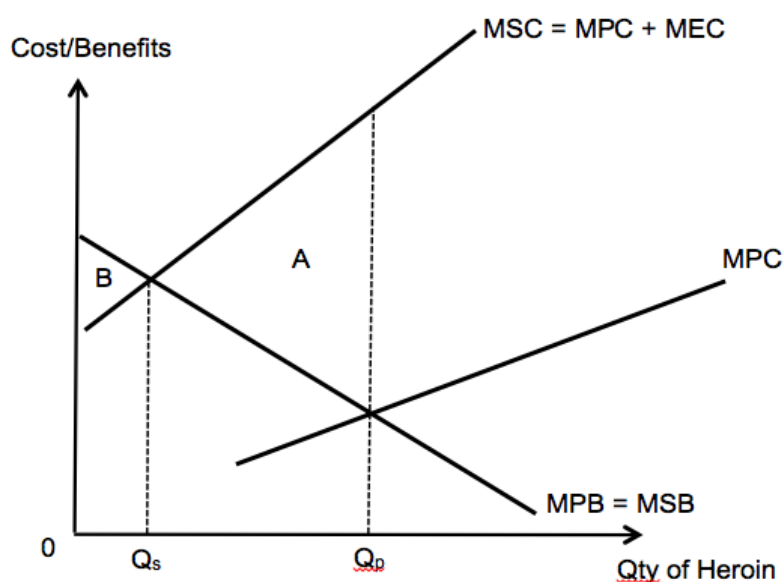


Figure 10: Comparing welfare loss due to negative externality vs total ban

⁵ Sunk costs are past expenditures that are unrecoverable. Refer to Sunk Cost Fallacy on page 23



Figure 10 compares the welfare loss caused by the externalities of consuming a product against the welfare loss brought about by banning the product.

If the product is not banned, there is a welfare loss equal to the area of the triangle marked A. This is because the consumer's utility maximising level, where $MPB = MPC$ is at OQ_P and this is higher than the socially optimal level of output, where $MSB = MSC$ is at OQ_S . The over-consumption of heroin results in deadweight loss reflected by area A.

However, if the government ban the consumption of heroin, consumption levels of heroin will fall to 0. Society will suffer a deadweight loss area reflected by area B due to the ban. This loss is due to the non-realization of the total welfare gain that the society will have if OQ_S of heroin is consumed. Thus, compared to the socially optimal output of OQ_S , zero consumption, due to ban, will lead to net total welfare loss of area B.

Although banning results in welfare loss, it can be seen from the above analysis that banning heroin results in a SMALLER welfare loss (Area B) than not attempting to control consumption at all (Area A).

Advantages of Total Ban

This is a direct method that reduces production/consumption to zero. It is straight forward and easy to implement.

Limitations of Total Ban

Similar to a quota, in the case of a total ban, enforcement costs may be high and it might be difficult to ensure compliance as regular checks would be required to be conducted.

The use of a total ban would likely result in a case where there will still be a welfare loss incurred by the society as it may not be totally eliminated. Nevertheless, this may still be acceptable if the welfare loss is smaller than if the ban had not been imposed.

Also, if the total ban is implemented too suddenly, e.g., total ban on sale of chewing gums in Singapore, it may result in resentment among the citizens in the country.



THINK ABOUT IT

Qn: Is a total ban always the best solution?

A total ban will be the best solution if:

- MEC generated is very large
- Banning results in a SMALLER welfare loss than not attempting to control consumption at all.
- Banning is phased in and society in general is accepting of the ban.
- Enforcement costs is low and it is easy to ensure compliance over time.



d) Tradable Permits

How does a tradable permit system work?

Tradable permits are designed to reduce pollution e.g. greenhouse gas emissions. Tradable permits are quotas for pollution that firms and individuals can trade freely to create a market for the right to pollute. With the permits, firms and individuals may continue to carry out their production which generates negative externalities.

A government first decides how much of a particular gas may be emitted yearly. It then divides this quantity up into a number of tradable emission entitlements and allocates or auctions them to individual firms. This gives each firm a quota of greenhouse gases that it can emit in a year.

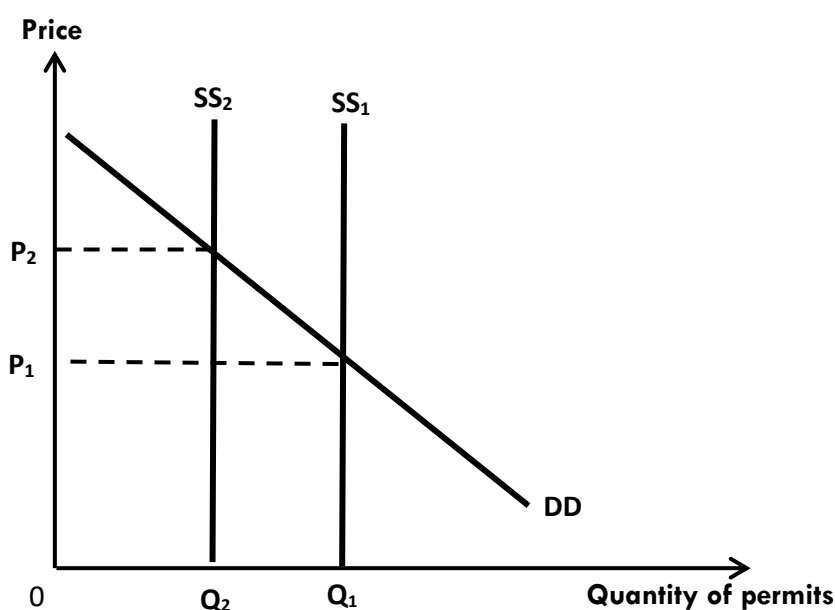


Figure 11: Market for Permits to Pollute

By setting a quota on the level of permissible pollution in the market, a socially optimal level of emissions can be targeted. This can be at either Q_1 or Q_2 as seen in Figure 11.

Once the quota is allocated, the market forces take over. The permits to pollute can be bought and sold among firms, with the price of permits determined by demand and supply forces. Since the number of permits available to pollute is fixed, the supply is perfectly price inelastic. The equilibrium price of permits is thus determined by the interaction between the demand and supply for these permits. As seen in Figure 11, the price of a permit to pollute would be at P_1 if quota was set at Q_1 .

As firms do not all face the same costs in reducing their emissions, those firms that can reduce their emissions relatively cheaply may be incentivised to do so as they can now sell their unused emissions permits to other firms. Those that find it expensive to cut emissions may find it attractive to buy additional permits from other firms.

Assume that firms producing aluminium finds it cheaper to purchase permits rather than seek cleaner ways of production. Through tradable permits used (assume price of permit per unit of aluminium = MEC at OQ_s), producers would now internalise the external cost and this would shift the MPC curve to MPC' which happens to coincide with MSC as seen in Figure 12. As a result of this, producers would now produce up to the point where $MPC' = MPB$ which coincides with the same point where $MSC = MSB$ and produce OQ_s amount of aluminium. The use of tradable permit results in the internalisation of the external cost and eliminates the deadweight loss of area ABC.

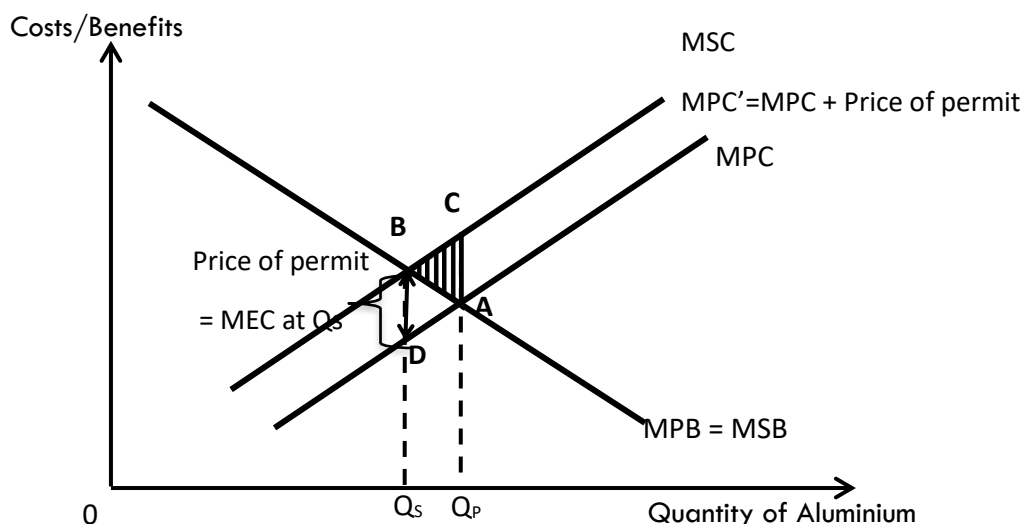


Figure 12: Socially optimal outcome achieved from the use of a tradable permit system

Advantages of Tradable Permits

By using tradable permits, the government would be able to achieve its desired level of pollution with greater certainty compared to the use of other policies like taxes. The government is able to pre-determine the socially optimal level of production that produces the 'ideal' amount of pollution.

There is also flexibility in the system as across time, this level of emissions can also be adjusted so that the desired emission levels would be possible. As seen in Figure 11, the government can progressively reduce the number of permits issued across time and the level of emissions would be reduced from Q_1 to Q_2 , with Q_2 as the socially optimal level of emissions, that the economy seeks to achieve eventually.

The use of a tradable permit system also encourages and incentivises firms to switch to cleaner and greener methods of production so that they would be able to lower pollution levels. By doing so, it would then allow these firms to sell their unused permits to other firms who may need it.

Limitations of Tradable Permits

While this measure encourages the producers to find ways to reduce pollution so that they can sell their pollution rights or permits at a profit, it is difficult for the government to estimate the amount of permits to issue in the first place due to the lack of perfect information. The problem is compounded as the government has to estimate the socially optimal level of pollution accurately in order to issue the right amount of permits.

If polluting firms find it cheaper to buy such permits from other under-polluting firms than to reduce pollution in their production process, they will continue to pollute. Tradable permits can thus dampen the incentive to reduce pollution levels for some firms.

Furthermore, there is a lack of incentive to reduce pollution levels below the allocated 'quota' for each firm as they may see it as a form of 'sunk cost' or a waste not to 'use up' the quota. Hence, they may continue to pollute even if they actually have means to lower pollution levels.

Please refer to Annex Section 6.4 & 6.5 to learn more about actions taken to reduce the effects of negative externalities on the environment.



e) Government Legislation & Regulation

How does government legislation & regulation work?

Government legislation and regulation is a powerful tool to correct market failures arising from the presence of negative externality in production.

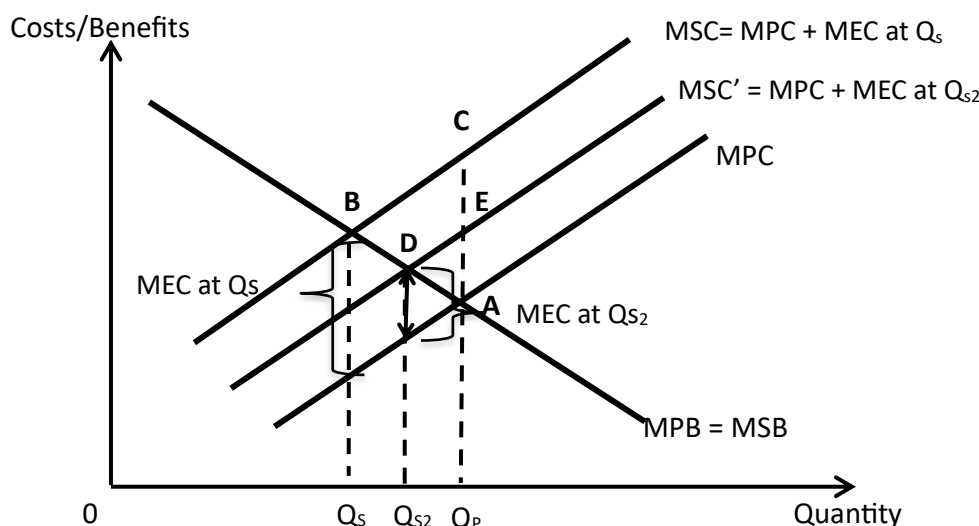


Figure 13: Socially optimal outcome achieved from the use of government legislation & regulation

When the government enacts a regulation such that it is compulsory for all producers to equip their factories with emission reduction devices to reduce pollution, this would lead to a reduction in the level of negative externality generated.

As seen in Figure 13, before the enactment of the regulation, the firm would originally seek to maximise profits and produce at OQ_p as it produces up to $MPB = MPC$. Socially optimal equilibrium would be where $MSB = MSC$ and this occurs at OQ_s .

With the enactment of the regulation, as these emission reduction devices led to the reduction in the negative externality generated, therefore the MEC generated would likely have fallen from MEC at Q_s to MEC at Q_{s2} . As $MSC = MPC + MEC$, since MEC has fallen in value, this would mean that there is a shift in MSC from MSC to MSC' and as a result of this, a new socially optimal equilibrium, where $MSB = MSC'$ is achieved at OQ_{s2} .

Due to the regulation, the deadweight loss would also decrease from the initial area of ABC to the new area of ADE. This helps to reduce the extent of market failure in the market.

Advantages of government legislation & regulation

Such a measure is simple and relatively easy to administer. Inspectors can conduct checks to ensure compliance.

Limitations of government legislation & regulation

Penalties implemented would have to be severe enough to deter offenders. More frequent checks would need to be conducted otherwise and this can raise the cost of monitoring. Similar to the use of a total ban, the use of government legislation and regulation may likely result in a case where there will still be a welfare loss incurred by the society as the deadweight loss may not be totally eliminated.



How would questions that require you to make use of this understanding look like?

Have a look at the following question.

*This question corresponds to **Sect A Qn 1ii & 2dii** of your Microeconomic Objectives and Policies Tutorial package.*

Section A CSQ 1

- (ii) Discuss why one government chooses to use tax while the other adopts ban to achieve efficient allocation of resource. [8]

Section A CSQ 2

- (dii) Discuss whether the use of regulation is sufficient to solve the market failure in (d) (i). [9]



3.1.4. Positive Externalities in Consumption

Positive externalities in consumption occurs when external benefits are enjoyed by third parties due to the consumption of a good or service. An example of an activity that generates positive externality in consumption is when an individual gets a vaccination.

People who get vaccinated against an infectious disease not only reduce their own likelihood of contracting the disease, but they also reduce the chance of transmitting the disease to others. The benefits of vaccination are not only confined to the individuals who are vaccinated as people who do not go for the vaccination will also benefit when the probability of contracting diseases, such as measles, is now reduced. With a lowered risk of contracting diseases, third parties such as family, friends and colleagues are now able to be healthy and work productively to earn a higher income. Hence, vaccinations provide external benefits to third parties not involved in the consumption of vaccines.

However, individuals who aim to maximise their self-interest, will base their decision on their Marginal Private Benefit (MPB) and Marginal Private Cost (MPC) instead of Marginal Social Benefit (MSB) and Marginal Social Cost (MSC).

Marginal Private Benefit (MPB) is the additional benefits obtained directly by those who consume an additional unit of the good or service. In this case, the marginal private benefit is the immunity against certain diseases and the improvement in health enjoyed by individuals when an additional unit of vaccination is consumed. Marginal Private Cost (MPC) is the additional cost incurred by the individuals when an additional unit of vaccination is consumed, for e.g., cost of the additional unit of vaccination.

Marginal External Benefit (MEB) can be defined as the additional benefits accruing to people other than the consumers or producers who are not involved in the consumption of an additional unit of the good or service. In this context, external benefits come in the form of a healthier and more productive labour force due to the prevention of the spread of disease to others.

Marginal Social Benefit (MSB) is the additional benefits to the whole society when an additional unit of vaccination is consumed. MSB is obtained by adding Marginal Private Benefit (MPB) of consuming the good to the Marginal External Benefit (MEB).

$$MSB = MPB + MEB$$

Thus, due to the positive externality in consumption, it leads to a divergence⁶ between MPB and MSB i.e., $MSB > MPB$ as shown in Figure 14.

In the example of vaccination, we assume that there are no external costs. Thus, there is no divergence between social and private costs i.e., $MPC = MSC$.

In this case, assuming a perfectly competitive market, the MPB is effectively the demand curve while the MPC is effectively the supply curve.

⁶ A divergence is used here as the difference between marginal social benefit and marginal private benefit. The 2 sets of curves can be drawn either parallel or non-parallel. When the 2 sets of curves are drawn parallel, it assumes that MEB remains constant at all output levels though this may not necessarily hold true in the real world.

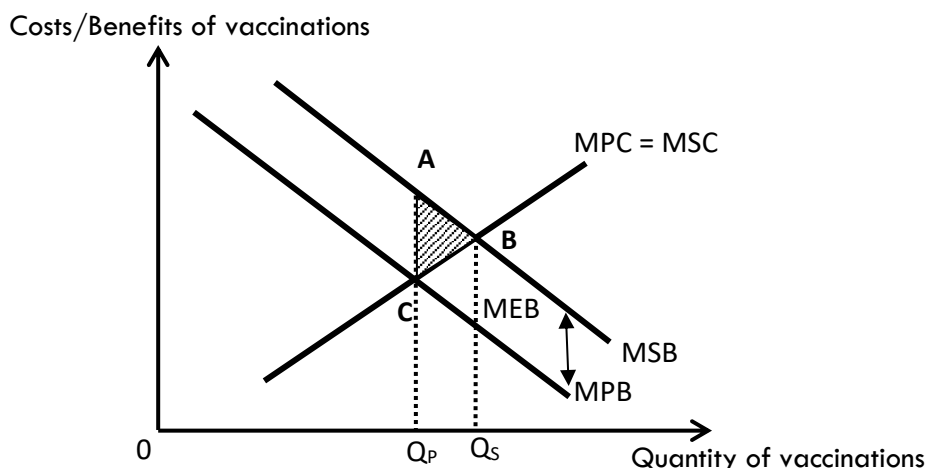


Figure 14: Positive Externalities in consumption⁷

As individuals base their decisions on self-interest, those who decide to get vaccinated will only consider their Marginal Private Benefit (MPB) and Marginal Private Cost (MPC) instead of Marginal Social Benefit (MSB) and Marginal Social Cost (MSC).

Left to the free market, the level of consumption will be at $0Q_P$ in Figure 14. This is because consumers are motivated by their self-interest and will consume up to the point where their Marginal Private Benefit (MPB) = Marginal Private Cost (MPC). Hence, $0Q_P$ represents the free-market equilibrium level of consumption of vaccines.

However, due to the presence of positive externality in the consumption of vaccines, MSB is greater than MPB. The socially optimal level of consumption occurs at $0Q_S$ where $MSB=MSC$.

Therefore, from society's point of view, left to the free market where consumption is $0Q_P$, the vaccine is under-consumed. Thus, more units of the vaccine should be consumed to attain the socially optimal level of consumption as $0Q_P < 0Q_S$.

In this case, the price mechanism fails to bring about a socially efficient allocation of resources. This is because the external benefits are not considered by the individual consumers and thus not priced by the price mechanism, resulting in the divergence between MPB and MSB.

When the number of vaccines is under-consumed by Q_PQ_S units, the area representing the social benefits accorded to the society of this quantity of Q_PQ_S that is not consumed is equal to area Q_PABQ_S while the area representing the social costs is equal to area Q_PCBQ_S .

Since social benefits (Q_PABQ_S) > social costs (Q_PCBQ_S) for the amount under-consumed i.e. Q_PQ_S , there will be a welfare/deadweight loss of area ABC as a result of the under-consumption by Q_PQ_S .

To maximise society's welfare, the quantity consumed should increase to $0Q_S$ because for all units from Q_P to Q_S society values the extra unit of the vaccine more than the costs to society. Hence, there is an under-allocation of resources to the consumption of this good. More resources should be allocated to achieve allocative efficiency.

⁷ Please note that it is important to label the axes according to the context/example suggested. Since the example given is vaccination, the y-axis should be labelled as costs/ benefits of **vaccination** and the x-axis should be labelled as quantity of **vaccination**.

⁸ Note that while $MPC=MSC$ when we have a positive externality, the socially optimal level of output should be where $MSB=MSC$ but not $MSB=MPC$.



How Positive Externalities in Consumption Lead to Market Failure

<u>Step 1</u> Identify source of market failure	Positive externalities in consumption occur when external benefits are enjoyed by third parties from the consumption of a good or service by private individual.
<u>Step 2</u> Explain divergence	<p>In the consumption of vaccinations, a person incurs private costs such as the cost of vaccination while enjoying private benefits such as the immunity against diseases.</p> <p>The consumption of vaccinations generates positive externalities as external benefits are generated in the form of a healthier and more productive labour force due to the prevention of the spread of disease to others.</p> <p>The presence of external benefit ($MEB > 0$) leads to a divergence between MPB and MSC. Marginal social benefit (MSB) is higher than the marginal private benefit (MPB).</p>
<u>Step 3</u> State assumptions	Assuming no negative externalities ($MEC = 0$), $MPC = MSC$
<u>Step 4</u> Identify free market equilibrium (Q_p)	Left to the free market, the level of consumption will be at OQ_p in Figure 14. This is because consumers are motivated by their self-interest and will consume up to the point where their Marginal Private Benefit (MPB) = Marginal Private Cost (MPC).
<u>Step 5</u> Identify social equilibrium (Q_s)	The socially optimal equilibrium, where societal welfare is maximised occurs when $MSB = MSC$ at OQ_s .
<u>Step 6</u> Compare Q_p & Q_s	The market equilibrium OQ_p is lower than the socially optimal quantity OQ_s .
<u>Step 7</u> Identify area of DWL and link to market failure	<p>Therefore, from society's point of view, left to the free market where consumption is OQ_p, the vaccine is under-consumed. When the number of vaccines is under-consumed by Q_pQ_s units, the area representing the social benefits accorded to the society of this quantity of Q_pQ_s that is not consumed is equal to area Q_pABQ_s while the area representing the social costs is equal to area Q_pCBQ_s.</p> <p>Since social benefits (Q_pABQ_s) > social costs (Q_pCBQ_s) for the amount under-consumed i.e. Q_pQ_s, there will be a welfare/deadweight loss of area ABC as a result of the under-consumption by Q_pQ_s. Hence, there is an under-allocation of resources to the consumption of this good. More resources should be allocated to achieve allocative efficiency.</p>



3.1.5. Positive Externalities in Production

Positive externalities in production occurs when external benefits are enjoyed by third parties due to the production of a good or service. An example of an activity that generates positive externality in production is when a firm engages in research and development (R&D).

When the firm undertakes a R&D project to come up with a new technology (assuming the success of the project), the marginal private benefit enjoyed by the firm would be the additional revenue generated from the use of this technology when a firm undertakes an additional unit of R&D project. The marginal private cost incurred would be the additional costs incurred in the form of wages, raw material costs when the firm undertakes an additional unit of R&D project.

If other firms also have access to the results from the R&D project, then there is a positive externality in production as there is an external benefit accorded to those not directly involved in the R&D activity. For example, the other firms are able to benefit from the R&D efforts undertaken and adopt the new technology without having to incur the high R&D costs. Therefore, the benefits of the R&D extend beyond the firm that finances it. The external benefits could also include higher economic growth for the whole economy as a result of increased productivity from the adoption of the new technology.

Similar to the case of positive externality in consumption, a positive externality in production would lead to a divergence between MSB and MPB as represented in Figure 15, where $MSB > MPB$ at all output levels.

Let's assume that there is no negative externality i.e., $MPC = MSC$.

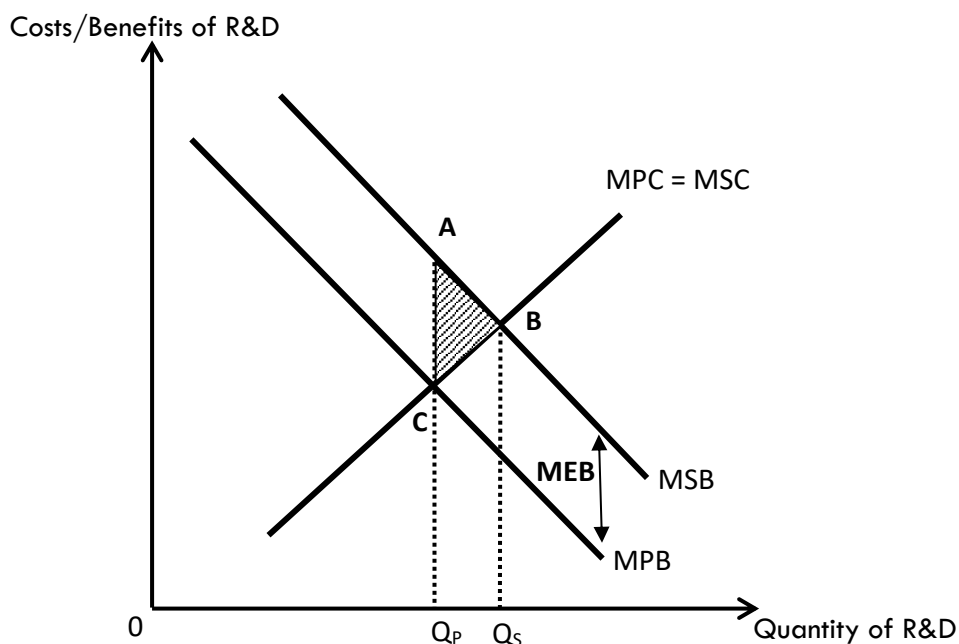


Figure 15: Positive Externalities in production

The firm undertaking the R&D project, would aim to maximise its profits and thus will base its output decision on its Marginal Private Benefit (MPB) and Marginal Private Cost (MPC) instead of Marginal Social Benefit (MSB) and Marginal Social Cost (MSC).

Left to the free market, the firm would undertake R&D up to OQ_P in Figure 15. This is because the firm, motivated by self-interest, will produce up to the point where Marginal Private Benefit (MPB) = Marginal Private Cost (MPC). Hence, OQ_P represents the market equilibrium level of production.



However, the socially optimal output level for R&D is achieved where $MSB = MSC$ and the amount of should be at OQ_s .

Thus, from society's viewpoint, more units of R&D activities should be produced to attain the socially optimal level of production. This means that the level of R&D is under-produced.

In this case, the price mechanism fails to bring about a socially efficient allocation of resources in the market for R&D. The reason is that the external benefits of R&D are not priced by the price mechanism and therefore not included by the producers in their decision-making, resulting in the divergence between MSB and MPB .

When the amount of output is under-produced by Q_PQ_S units, the area representing the social benefits accorded to the society of this quantity of Q_PQ_S that is not produced is equal to area Q_PABQ_S . On the other hand, the area representing the social costs to produce Q_PQ_S is equal to area Q_PCBQ_S .

Since social benefits $>$ social costs for the amount under-produced i.e., Q_PQ_S , there will be a welfare/deadweight loss of area ABC as a result of the under-production by Q_PQ_S .

To maximise society's welfare, the quantity produced should increase to OQ_S because for all units from Q_P to Q_S society values the extra unit of the good more than the costs to society. Hence, there is an under-allocation of resources to the production of this good. More resources should be allocated to achieve allocative efficiency.

How Positive Externalities in Production Lead to Market Failure

<u>Step 1</u> Identify source of market failure	
<u>Step 2</u> Explain divergence	
<u>Step 3</u> State assumptions	
<u>Step 4</u> Identify free market equilibrium (Q_P)	
<u>Step 5</u> Identify social equilibrium (Q_S)	
<u>Step 6</u> Compare Q_P & Q_S	
<u>Step 7</u> Identify area of DWL and link to market failure	

TIPS

Try filling up the table on your own and see if you are able to complete it



How would questions that require you to make use of this understanding look like?

Have a look at the following question.

*This question corresponds to **Sect A Qn 3g & Qn 6f** of your Microeconomic Objectives and Policies Tutorial package.*

Section A CSQ 3

- (g) With reference to Extract 1 and 4, state and explain **one** possible reason why economic efficiency is not achieved in the market for education. [6]

Section A CSQ 6

- (f) Using Extracts 3 and 4, assess whether positive externalities is the main reason for government intervention in health screening. [8]



3.1.6. Government Intervention to Deal with Positive Externalities

a) Subsidies

In the case of positive externalities in production or consumption, resources are under-allocated to the production or consumption of the good such that the good is under-produced or under-consumed. The government can therefore subsidise the production or the consumption of goods that generate positive externalities. This subsidy can be provided either to the producers or consumers.

Positive Externality in Production

Let us re-visit the case of the firm that undertakes research and development.

Costs/Benefits of Research & Development

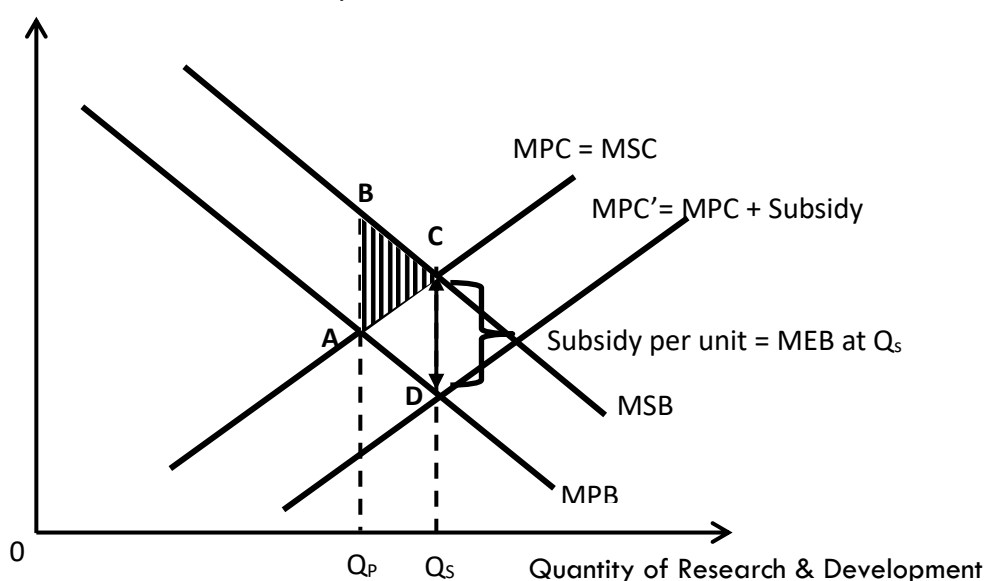


Figure 16: Case of positive externalities in production (subsidies provided to producers)

How does a subsidy work?

To correct the under-production of and therefore under-allocation of resources to R&D, the government provides a per unit subsidy that is equal to the marginal external benefits (MEB) at OQ_s which is the socially optimal output where $MSB = MSC$. This is given to the firm undertaking the R&D.

With the subsidy, the producers' cost of production would fall from MPC to MPC' . This shifts the MPC curve by CD to the MPC' curve, where $MPC' = MPC + \text{Subsidy}$. Producers now produce OQ_s amount of output where $MPB = MPC'$. This production level coincides with the socially optimal level of output where $MSB = MSC$, i.e., OQ_s .

The deadweight loss of ABC is eliminated. As a result, resources are efficiently allocated and society's welfare is thus maximised.



Positive Externality in Consumption

Subsidies on Consumption

The government may correct for under-consumption due to positive externalities in consumption by providing a direct subsidy to consumers. An example is in the case of vaccination against chicken pox by direct reimbursement. An analysis of this is illustrated in Figure 17 below.

Let's say the government wants to increase the consumption of chicken pox vaccination because it is under-consumed by the society if left to the free market.

Costs/Benefits of Chicken Pox Vaccination

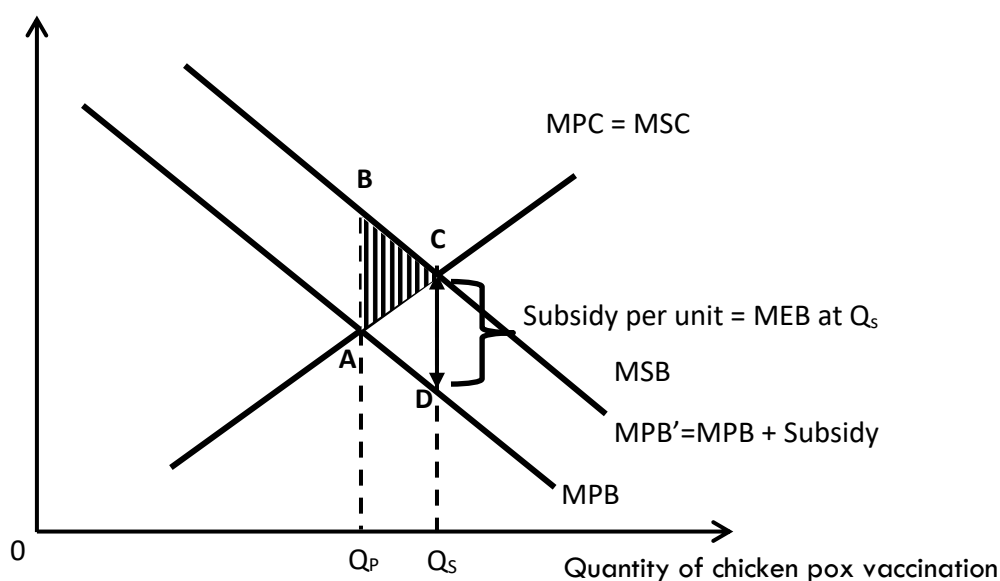


Figure 17: Case of positive externalities in consumption (subsidies given to consumers)

How does a subsidy work?

To correct the under-allocation of resources and therefore under-consumption of chicken pox vaccination, the government provides a per unit subsidy to consumers that is equal to the marginal external benefits at OQ_S which is the socially optimal output level. This is represented by the vertical distance (CD) between the MPB and the MSB curves at OQ_S . This will shift the MPB curve by CD to coincide with the MSB curve.

Due to the subsidy of CD per unit, consumers will internalise the value of the external benefits. With the subsidy, the consumers will now consume up to the point where $MPB' = MPC$ which happens to be the same consumption level that is deemed to be socially optimal, OQ_S , where $MSB = MSC$.

The deadweight loss area of ABC is eliminated. Thus, the resources would be efficiently allocated and society's welfare is maximised.



THINK ABOUT IT

Qn: Using the same example of vaccinations against chicken pox, what happens if the subsidies were given to producers instead?

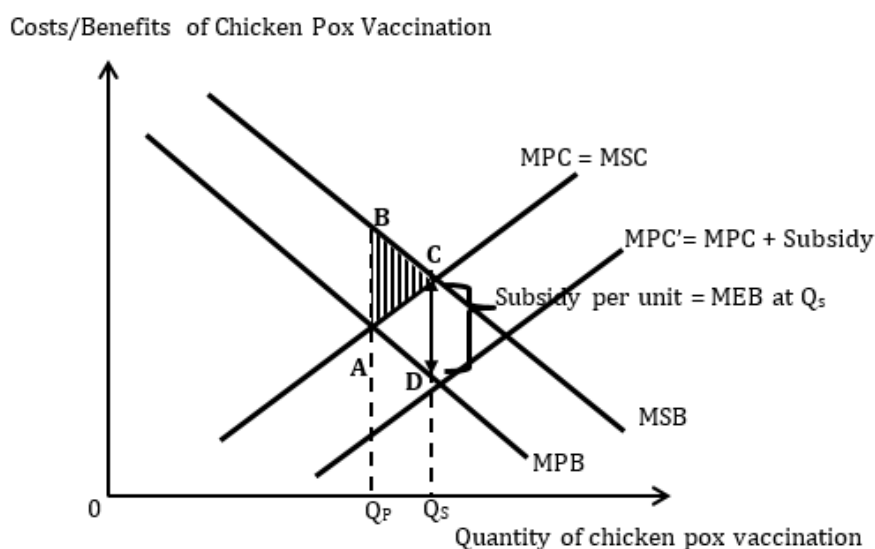
Like the example above, the government wants to increase the consumption of chicken pox vaccination because it is under-consumed by the society.

However, instead of reimbursing the consumers, the government provides a subsidy to the producers which would therefore lead to the effect of a fall in cost of production for the vaccines.

Assuming the cost savings is passed on to the consumers, this reduces the MPC of the consumers as they will now pay less for the vaccine.

TIPS

Please note that the assumption of cost savings being passed on to the consumers is required as we are looking at the MPB and MPC from the perspective of consumers in this context



**Figure : Case of positive externalities in consumption
(subsidies given to producers)**

To correct the under-allocation of resources and therefore under-consumption of chicken pox vaccination, the government needs to provide a subsidy that will allow the cost savings passed on to consumers to equal to the marginal external benefit (MEB) at OQ_s which is the socially optimal output as seen in figure above.

This is represented by the vertical distance (CD) between the MPB and the MSB curves at OQ_s . Instead of shifting the MPB, this will now shift the MPC curve by CD to MPC'. This is because the subsidy lowers the cost of providing the inoculations and producers pass on the lower cost to consumers in the form of lower prices.

Market equilibrium is now achieved where the socially optimal level of output is OQ_s . Resources are thus efficiently allocated, and society's welfare is maximised. At OQ_s , the deadweight loss of area ABC is eliminated.



THINK ABOUT IT

Qn: Would providing free access to a good or service be the best way to achieve efficient allocation of resources?

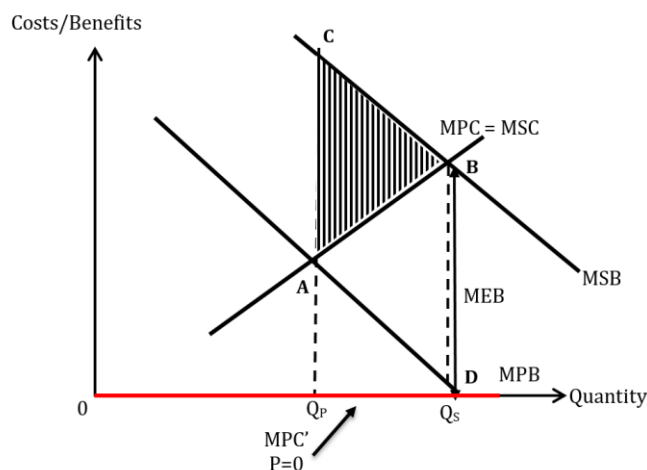


<https://www.channelnewsasia.com/news/singapore/s-poreans-prs-to-get-free-entry-to-national-museums-amp-heritage-8342212>

Let's take a look at the example of the government providing free access to national museums. Left to the free market, consumers would seek to maximise their utility and consume up to the point where $MPB = MPC$ and this occurs at OQ_p as shown in diagram below. However, the socially optimal level of consumption should be at OQ_s where $MSB = MSC$. This results in the DWL area of ABC.

When the Singapore government decides to provide free entry to the museums, this would lead to the marginal private cost of consumers (MPC) to shift to MPC' which is where price is equal to zero ($P=0$).

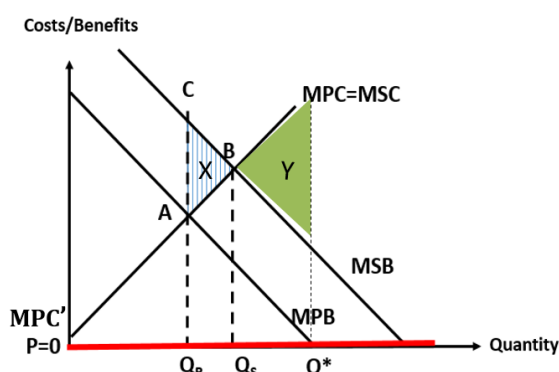
Consumers, seeking to maximise their utility, would consume up to the point where $MPB = MPC$. In this case, consumers would thus consume up to the point where $MPB = MPC' = 0$ and this occurs at the point OQ_s , which coincides with the socially optimal level of consumption thus addressing the problem of under-consumption as OQ_p was initially lower than OQ_s .



By providing subsidies such that there is free provision of the good or service would only be the best method if you are able to achieve the socially optimal level of consumption, OQ_s as seen above. However, this may not always be the case.

**[Continued]**

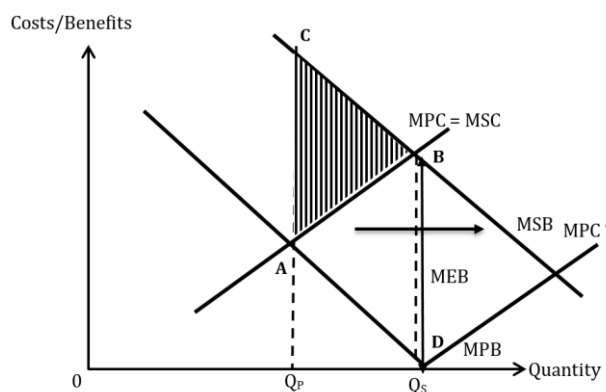
When goods or services are provided for free, consumers tend to overconsume the goods or services and thus could result in the scenario of over-consumption as shown below.



Due to the free provision, this causes the MPC to decrease to MPC' where $P = 0$, this would lead to consumers to consume at OQ^* as they seek to maximise their utility and consume up to the point where $MPB = MPC' = 0$. This is much higher than the socially optimal consumption level of OQ_s . This would lead to the DWL area Y as shown above. This deadweight loss is larger than the original DWL area of ABC represented by DWL area X.

Additionally, providing subsidies to the extent of free provision would incur large opportunity costs as the money could be spent on other purposes such as defence or education.

An alternative way of illustrating this case of providing a full subsidy such that there is free access to the good or service is seen below.



When the government decides to provide free entry to the museums, the government is providing a full subsidy equal to MEB at OQ_s (which is represented by the distance BD), this would lead to MPC to decrease to MPC' .

Consumers, seeking to maximise their utility, would consume up to the point where $MPB = MPC$. In this case, consumers would thus consume up to the point where $MPB = MPC'$ and this occurs at the point OQ_s , which coincides with the socially optimal level of consumption where $MSB = MSC$, thus addressing under-consumption.



Advantages of Subsidies

A subsidy is popular and can be easily implemented to bring about the desired consumption or production levels. By providing a per unit subsidy that is equal to the marginal external benefits at OQ_s , it is able to raise consumption or production level from OQ_p to OQ_s – the socially optimal level, and deadweight loss can be completely eliminated.

Subsidies are also flexible as they can be adjusted up or down to achieve the OQ_s level. Thus, even with imperfect information, subsidies can be adjusted until the desired level of consumption or production is achieved.

Subsidy can also improve equity and reduce social exclusion as low-income households who cannot afford the goods are now better able to have access to it.

Limitations of Subsidies

Although such a measure can help to achieve the allocatively efficient level of output, it is difficult to estimate the amount of subsidy to be provided as it is difficult to accurately measure the marginal external benefits (MEB). This is especially so, since firstly, it might be difficult to even identify who these third parties are. Secondly, it is almost impractical to impute a monetary value to such benefits for the purpose of computing the correct amount of subsidies to be given.

In addition, consumers and producers might over-consume and over-produce the goods or services respectively if they were heavily subsidised. Consequently, over-consumption/over-production may occur and result in an over-allocation of scarce resources to the market in which the government intervened – a failed attempt to achieve allocative efficiency.

There is always an opportunity cost to the provision of subsidies. Subsidies may also take a toll on the government budget as the subsidy given to consumers or producers could be channelled to other uses, e.g., the development of infrastructure.



b) Government Provision

How does government provision work?

Government provision can increase consumption of a good to be at/closer to the socially optimal level, OQ_s , if positive externalities exist. The government could provide these goods directly or they could pay private firms to do.

In the situation of under-consumption of chicken pox vaccines, through government's provision, it can ensure sufficient vaccines are produced, which can then be offered free or subsidised in the government polyclinics. This will increase consumption of the vaccines such that it would be at/ closer to the socially optimal level of consumption, OQ_s . This would hence correct the market failure.

Note:

Government provision can be carried out through joint provision, in which the government supplements what is being provided by the private sector. This is usually seen in the case of education and healthcare markets. E.g. The Singapore government, through the Ministry of Education, supplements in the provision of schools (180 primary schools, 136 secondary schools, 16 mixed level schools, 11 JC/CIs) (Source: www.moe.edu.sg)

While government provision could be offered free, it may not necessarily be so.

E.g. Singaporeans pay a heavily subsidised amount for school fees in MOE schools.



Qn: On what basis would government provide goods for free?

Advantages of Government Provision

Consumption level will be increased to be at/closer to the socially optimal level, OQ_s , if the government manages to estimate the amount to provide accurately.

Direct provision by the government may also result in better quality of goods and services since the government is able to closely monitor the service and production standards.

Limitations of Government Provision

Government provision requires financing which will take a toll on the government budget and diverts government resources away from other projects such as infrastructure development or educational programmes. This may affect the economic progress and future standard of living of the country.

In addition, while government provision will enable the government to directly provide the optimal amount of the good, it may also result in inefficiency as the government may be subject to government failures as well. This happens when the government, in its bid to intervene and correct the situation in the markets, ends up making the situation worse by creating greater inefficiency.

[Refer to Annex Section 6.2 for a more detailed analysis of the healthcare market in Singapore.]



c) Legislation

How does legislation work?

The government can formulate rules and legislation to bring the consumption of goods with positive externalities up to the socially optimal level where $MSB=MSC$ at OQ_s .

For example, recognising the external benefits of education as an enabler in skills acquisition, the Compulsory Education Act in Singapore came into effect on 1st Jan 2003. It enforces compulsory education for all Singaporeans up to Primary 6. This is targeted at bringing the consumption of education up till Primary 6 to the socially optimal level for the general population in Singapore, hence correcting the market failure by eliminating the deadweight loss.

Advantages of Legislation

This is a direct and fast approach in achieving the socially optimal outcome when necessary. It ensures that socially optimal level of consumption is achieved when consumers are compelled by laws to act appropriately. Those who violate the law would face punishment in the form of fines or imprisonment. Therefore, legislation may be deemed to be more effective than subsidies.

Limitations of Legislation

This measure entails high administration costs to ensure compliance by individuals. More manpower needs to be employed to conduct checks on individuals. Reporting and collation of data will also require manpower to ensure the maximum welfare of the society is attained.

Rules and legislation take time to be formulated. To strike a balance between being overly restrictive and being lax in their enforcement, it would require substantial amount of research and deliberation by government officials. In addition, as the circumstances change, such rules and regulations need to be reviewed regularly, thus incurring even higher costs in the years ahead.



How would questions that require you to make use of this understanding look like?

Have a look at the following question.

*This question corresponds to **Sect A Qn 3gii & Qn 6fii** of your Microeconomic Objectives and Policies Tutorial package.*

Section A CSQ 3

- (g) Using evidence from the case study and/or your own knowledge, discuss the view that Singapore government can best achieve economic efficiency in the market for education by providing subsidies. [12]

Section A CSQ 6

- (f) Discuss whether fully subsidising recommended health screenings is the best policy that the Singapore government should adopt to address the issues raised above. [10]



Key Question 5: How does the presence of information failure lead to market failure?

3.2. Presence of Information Failure and Government Intervention

Under perfect competition, every individual economic agent such as a firm or a consumer is assumed to have perfect knowledge about costs and benefits of selling or buying a good/service.

3.2.1. Imperfect Information in Imperfect Competition

Unlike the case of perfect competition where there is assumed to be perfect information, in reality firms may be unaware of the most efficient production methods.

Consumers also do not have perfect knowledge about the prices and quality of goods and services in the market.

In the factor market, factor owners may not have all the necessary information to make rational decisions. For example, workers may not have complete and accurate information regarding job opportunities and the wage rates being offered.

Information failure is also known as **imperfect information**.

This arises as a result of economic agents having **inaccurate, incomplete, uncertain** or **misunderstood information** to make rational decisions on choice and resource allocation.

Decisions made with imperfect information may result in scarce resources being misallocated. Hence, market failure results.

Causes of Imperfect Information

a) Persuasive Advertising

Persuasive advertising may exaggerate the benefits of a good e.g., beauty treatment & cosmetic surgery. Based on these exaggerated claims by advertisers, consumers, who lack accurate and complete information, will consume more of these advertised products.

As a result of these advertisements, consumers may over-estimate the perceived marginal private benefits from consuming these products. This can be seen in the market for skin care and slimming products where endorsements and advertisements by celebrities often make the products seem more effective than they actually are.

This leads to a consumption level that is higher than the socially optimal level.

Market failure results as societal welfare is not maximised because of the over-allocation of scarce resources to the production of such goods leading to deadweight loss.

**b) Product Complexity**

Consumers may not fully comprehend the benefits and costs of certain products such as laptops. They may not understand complex and technical terms such as processor speed, RAM etc. As a result, consumers may overestimate the marginal benefits of purchasing these products and purchase computers with higher specifications than what they actually need.

c) User inexperience

Due to inexperience, consumers may not take into account all the benefits and costs of using a product. For example, a new car user might not have considered additional costs of driving such as parking and fuel related charges.

d) Myopic Decision-Making

Consumers may not consider the long-term benefits and costs of their decisions as they tend to focus on the present and immediate consequences of their decisions. Hence, they may tend to underestimate the actual costs of their decisions. For example, smokers may know that smoking is detrimental to their health, but they may discount the long-term effects of smoking when they make decisions.

e) Addiction

Addiction could also cause consumers to underestimate costs and overestimate benefits. For example, someone addicted to video-gaming would overestimate the benefits of gaming such as the enjoyment derived from each game. However, he might underestimate the costs of gaming because he might not have considered the opportunity cost of this decision- the knowledge that he could have derived from spending the time studying instead.



3.2.2. Imperfect Information due to Under-estimation of Costs

Imperfect information arises when economic agents lack critical information to make rational decisions on choices and resource allocation. In the market for cigarettes, smokers, due to myopic decision-making, may under-estimate the private costs as they tend to focus on the short-term costs rather than the long-term damage to their health from cigarette smoking.

If left wholly to the free market, it is likely that cigarettes will be over-consumed because individuals do not appreciate the full extent of the ill effects on their health that can result from the consumption of cigarettes.

Hence the perceived marginal private costs of consumers, MPC (perceived), is lower than the true MPC , MPC (true), as shown in the following figure.

Assuming there was no externalities present, MPC (true) is equivalent to marginal social cost, MSC , while marginal private benefit (MPB) equals to marginal social benefit (MSB).

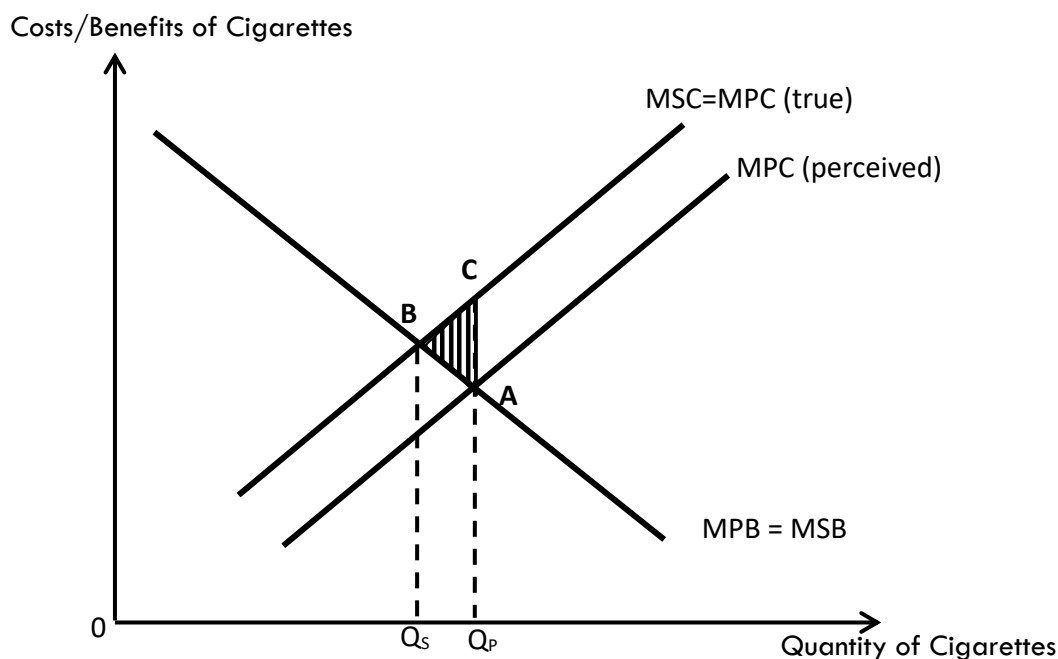


Figure 18: Over-consumption of Cigarettes

If there was no government intervention in the consumption of cigarettes, consumers will consume up to Q_p (where $MPB = MPC$ (perceived)). The socially optimal quantity is however at Q_s where $MSB = MSC$. Since Q_p is greater than Q_s , there is over-consumption of cigarettes when left to the free market.

The quantity over-consumed, $Q_s Q_p$, would have generated a social cost of $Q_s B C Q_p$, which exceeds its social benefit of $Q_s B A Q_p$. Thus, consuming Q_p instead of Q_s would result in a deadweight loss of area ABC for the society.

To maximise society's welfare, the quantity consumed should decrease to Q_s because for all units from Q_s to Q_p , the society incurs a higher cost than what society values the benefits as. Hence, there is an over-allocation of resources to the consumption of this good. Fewer resources should be allocated to achieve allocative efficiency.



How Under-estimation of Costs Lead to Market Failure

Step 1 Identify source of market failure	Imperfect information arises when economic agents lack critical information to make rational decisions on choices and resource allocation. In the market for cigarettes, smokers, due to myopic decision-making, may under-estimate the private costs as they tend to focus on the short-term costs rather than the long-term damage to their health from cigarette smoking.
Step 2 Explain divergence	Since smokers do not appreciate the full extent of the ill effects on their health that can result from the consumption of cigarettes, hence the perceived marginal private costs of consumers, MPC (perceived), is lower than the true MPC, MPC (true), as shown in Figure 18.
Step 3 State assumptions	Assuming there was no externalities present, MPC (true) is equivalent to marginal social cost, MSC, while marginal private benefit (MPB) equals to marginal social benefit (MSB).
Step 4 Identify free market equilibrium (Q_p)	If there was no government intervention in the consumption of cigarettes, consumers will consume up to $0Q_p$ (where $MPB = MPC$ (perceived)).
Step 5 Identify social equilibrium (Q_s)	The socially optimal equilibrium, where societal welfare is maximised occurs when $MSB = MSC$ at $0Q_s$.
Step 6 Compare Q_p & Q_s	Since $0Q_p$ is greater than $0Q_s$, there is over-consumption of cigarettes when left to the free market.
Step 7 Identify area of DWL and link to market failure	The quantity over-consumed, Q_sQ_p , would have generated a social cost of Q_sBCQ_p , which exceeds its social benefit of Q_sBAQ_p . Thus, consuming $0Q_p$ instead of $0Q_s$ would result in a deadweight loss of area ABC for the society. Hence, there is an over-allocation of resources to the consumption of this good. Fewer resources should be allocated to achieve allocative efficiency.



How would questions that require you to make use of this understanding look like?

Have a look at the following question.

*This question corresponds to **Sect A Qn 5c** of your Microeconomic Objectives and Policies Tutorial package.*

Section B CSQ 5

- (c) Explain how market failure arises from consumption of foods with partially hydrogenated oils (PHOs). [5]



3.2.3. Imperfect Information due to Under-estimation of Benefits

Imperfect information arises when economic agents lack critical information to make rational decisions on choices and resource allocation. In the market for education, individuals may underestimate the marginal private benefit (MPB) generated by the consumption of education due to myopic decision-making. They would only consider the benefits of consuming education in the immediate term rather than its potential benefits in the long run in the form of higher potential income as well as better job prospects.

If left wholly to the free market, it is likely that education will be under-consumed because individuals do not appreciate the full extent of the benefits that can be derived from the consumption of education.

Hence the perceived marginal private benefit of individuals, MPB (perceived) is lower than the true MPB, MPB (true), as shown in Figure 19.

Assuming there was no externalities present, MPB (true) is equivalent to marginal social benefit, MSB, while marginal private cost (MPC) equals to marginal social cost (MSC).

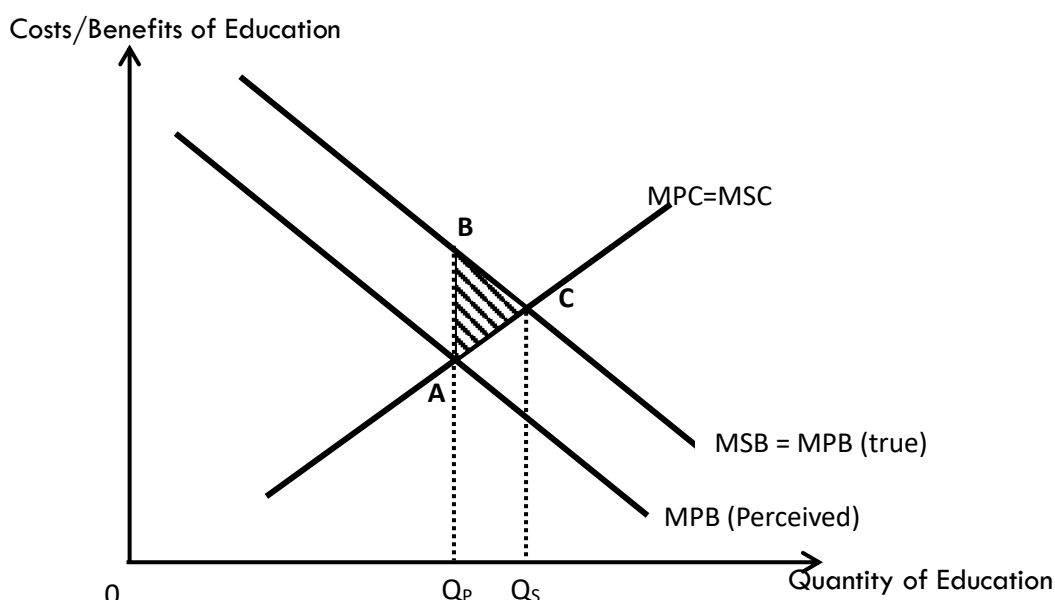


Figure 19: Under-consumption of Education

If there was no government intervention in the consumption of education, consumers will consume at $0Q_P$ (where $MPB \text{ (perceived)} = MPC$). The socially optimal quantity is however at $0Q_S$ where $MSB = MSC$. Since $0Q_P$ is smaller than $0Q_S$, there is under-consumption of education when left to the free market.

The quantity under-consumed, Q_PQ_S , would have generated a social benefit of Q_PBCQ_S which exceeds its social cost of Q_PACQ_S . Thus, consuming $0Q_P$ instead of $0Q_S$ results in a deadweight loss of area ABC for the society.

To maximise society's welfare, the quantity consumed should increase to $0Q_S$ because for all units from Q_P to Q_S , society values the extra unit of the good more than the costs to society. Hence, there is an under-allocation of resources to the consumption of this good. More resources should be allocated to achieve allocative efficiency.



How Under-estimation of Benefits Lead to Market Failure

<u>Step 1</u> Identify source of market failure	
<u>Step 2</u> Explain divergence	
<u>Step 3</u> State assumptions	
<u>Step 4</u> Identify free market equilibrium (Q_p)	
<u>Step 5</u> Identify social equilibrium (Q_s)	
<u>Step 6</u> Compare Q_p & Q_s	
<u>Step 7</u> Identify area of DWL and link to market failure	

TIPS

Try filling up the table on your own and see if you are able to complete it

Try drawing diagrams to show the consequences of imperfect information in the following scenarios:

1. Overestimation of costs
2. Overestimation of benefits

Check your answers here





Note: It is not uncommon for markets to have two or more sources of market failures.

Additional Information: Merit and Demerit goods

The production and/or consumption of many goods and services generate externalities.

However, there is a special class of such goods which are deemed to be either socially desirable or socially undesirable by the government.

Merit Goods

Merit Goods are goods and services deemed to be socially desirable by the government and which the government feels that people will under-consume if left to the free market because of consumers' failure to recognize the full benefits that could be derived from the consumption of the good.

Examples of merit goods include healthcare, vaccination, education and sports facilities.

Demerit Goods

Demerit Goods are goods and services that are deemed to be socially undesirable by the government and which the government feels that will be over-consumed if left to the free market due to consumers' failure to recognize the full costs resulting from the consumption of the good.

Examples of demerit goods include alcohol, cigarettes and narcotics like heroin and cocaine.

When answering questions, it is paramount to identify the various sources of market failure in a market and explain those required by the question.

Please refer to the following examples on how you can illustrate the effects of positive externalities and information failure on the market for education.

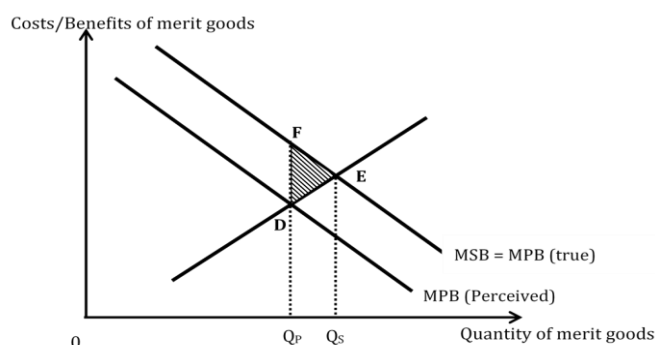


THINK ABOUT IT

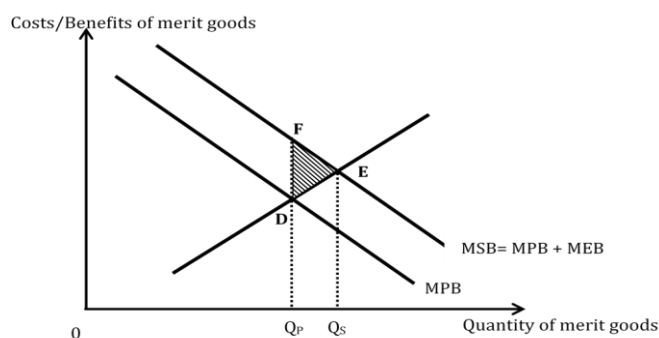
Qn: With the use of diagrams, how would you illustrate the case of market failure for a good which generates positive externalities in consumption as well as information failure?

There is information failure that results in an underestimation of the private benefits of education. E.g. parents not fully understanding how further education would lead to having better job prospects and much higher future income.

When left to the free market, private equilibrium level of education is consumed at $0Q_P$ where MPB (Perceived) is equal to MPC as consumers seek to maximise their utility. Socially optimal level of consumption is however at $0Q_S$ where MSB is equal to MSC. As such, there is under-consumption of Q_PQ_S amount of education when left to the free market, resulting in a DWL of area DEF.



There are also positive externalities when education is consumed. E.g. a more highly educated workforce brings about improvements in labour productivity. This improved labour productivity attracts foreign direct investments and helps to create employment.



When left to the free market, private equilibrium level of education is at $0Q_P$ where MPB is equal to MPC as consumers seek to maximise their utility. Socially optimal level of consumption is however at $0Q_S$ where MSB is equal to MSC. As such, there is under-consumption of Q_PQ_S amount of education when left to the free market, resulting in a DWL of area DEF.

**THINK ABOUT IT**

Qn: With the use of a diagram, how would you illustrate the presence of negative externalities as well as information failure in the consumption of cigarettes?



3.2.4. Government Intervention to Deal with Imperfect Information

a) Public Education

How does public education work?

In view that imperfect information could lead to market failure, one way to overcome this is to make information more readily available and transparent through different platforms and media e.g., online platforms and campaigns. The government can set up agencies or conduct campaigns to disseminate information or encourage up-to-date and accurate posting of information by firms.

Through this, the government is able to influence the behaviour of consumers through public education and campaigns such that consumption level would reach the socially optimal level, $0Q_s$, where $MSB=MSC$.

When dealing with the information failure in the market for cigarettes, government often implement educational campaigns to educate the public on the consequences of smoking. The Health Promotion Board (HPB) works with community organisations and organises programmes to help smokers to quit smoking. Efforts to raise awareness of smoking-related issues among the general public also includes an annual smoking control campaign and marketing efforts via social media.

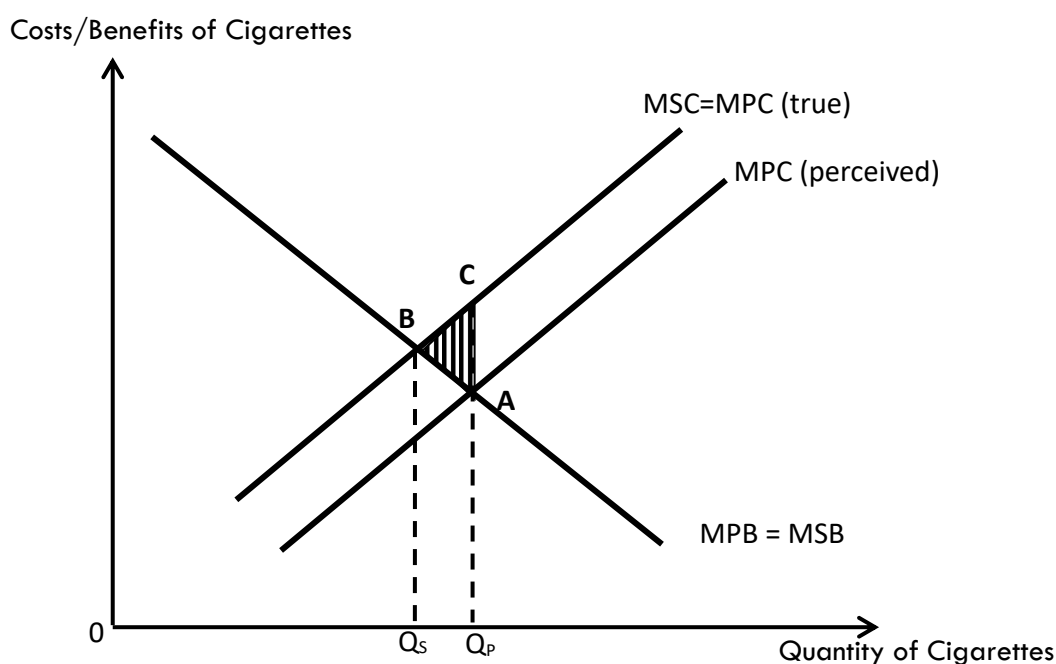


Figure 18: Over-consumption of Cigarettes (reproduced)

Assuming the success of these campaigns in conveying the information to smokers, this would shift the MPC (perceived) to MPC (true). As a result, smokers would now consume at $MPB=MSC$ (true) which happens to coincide with the socially optimal output level $0Q_s$, where $MSB = MSC$.

As a result of this, the deadweight loss area ABC would now be eliminated and allocative efficiency is achieved.



Similarly, when dealing with the imperfect information due to the under-estimation of benefits in the market for education, campaigns or public education can be utilised to raise the awareness of the benefits of consuming education. Such campaigns and public education could enable individuals to realise the benefits that they could receive from consuming education.

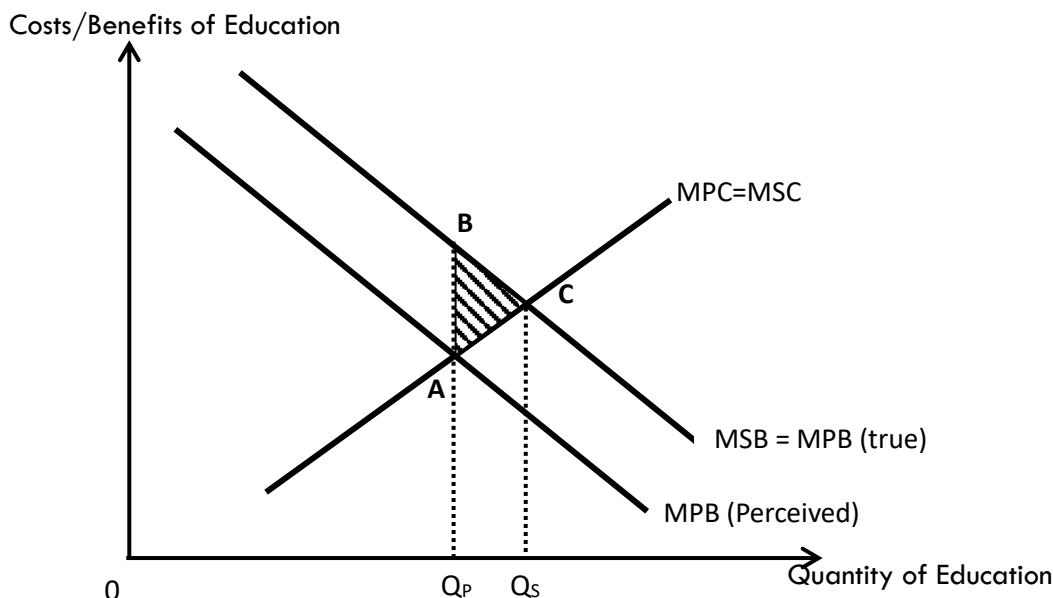


Figure 19: Under-consumption of Education (reproduced)

Assuming the success of these campaigns in conveying the information to the individuals, this will have the effect of shifting MPB (perceived) to MPB (true). As a result, individuals would now consume education up to $MPB (true) = MPC$, which happens to coincide with the socially optimal output level, Q_s , where $MSB = MSC$.

Thus, the implementation of campaigns or public education encouraged consumption and eliminates the deadweight loss caused by imperfect information due to underestimation of benefits.

Advantages of Public Education

Public education reduces the information gap and allows producers/consumers to be more aware of their true cost/benefits. Thus, it helps to tackle the root cause of the problem if imperfect information is the cause of the market failure. By directly addressing the root problem, the society will now be able to consume or produce closer to/at the socially optimal level.

If the public education campaign is very successful, minimal government efforts/funds will be needed in the future to solve the problem of under-consumption.

Governments may also use salience bias in designing public campaigns to increase the effectiveness of their campaigns.

For example, as obesity is a more visible problem as compared to other health issues like diabetes, the public education campaigns aimed at reducing sugar consumption are likely to be more successful if it were to focus on how less sugar can help weight loss rather than how it can help prevent diabetes.



Limitations of Public Education

Public Education is a long-term policy as results can only be seen after a considerable period of time. This is especially true in changing habits and mind-sets of the population. This can be challenging when it involves addictive habits. For example, smokers may not see the need to change their habits despite being presented with greater information about the harmful effects smoking brings about to one's health.

Further, it is also difficult to persuade the general public to go for routine health check-ups simply because most people do not see the need to as they deem that they are relatively healthy. Hence, the effectiveness of public education is subject to the level of receptivity of the public to the information shared.

Also, public education campaigns can be costly as high costs are incurred for advertising as well as research. In order to finance these expenditures, governments would also incur opportunity cost.



b) Rules and Regulations

How do rules and regulations work?

The government can make implement rules and regulations to correct market failure associated with imperfect information.

When dealing with the information failure in the market for cigarettes, the government can implement legislation to mandate cigarettes producers to print warnings on cigarette boxes to inform smokers about the harmful effects of smoking. Since July 2020, the Singapore government legislates that tobacco products sold must have standardised packaging and that at least 75% of the packaging is labelled with graphic health warnings depicting the effects of smoking. The intention of these explicit images detailing the harmful consequences of smoking would correct the perception of the private cost of smokers, thereby allowing them to make a more informed decision.

Costs/Benefits of Cigarettes

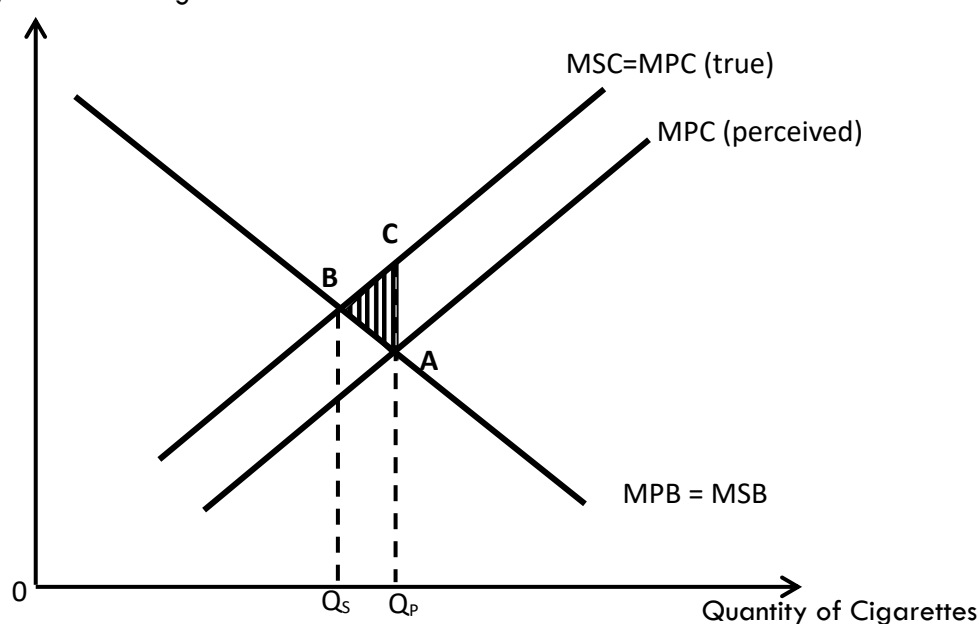


Figure 18: Over-consumption of Cigarettes (reproduced)

This measure will have the effect of shifting the MPC (perceived) of smokers up to MPC (true)=MSC. The smokers, after being made more aware of the harmful effects of smoking, will now consume at a quantity where MPC (true)=MPB and this coincides with the socially optimal level of output OQ_s , where $MSB=MSC$. As a result of this, the deadweight loss area ABC would now be eliminated and allocative efficiency is achieved.



Read about it – Mandatory nutrition labels? The bitter truths about our sugar problem



Drinks with high sugar content that are sold not just by food outlets and caterers, but also in non-retail settings such as workplaces, schools and healthcare institutions, will be required to display Nutri-Grade labels from end-2023. This applies to pre-packaged and freshly prepared drinks, and extends to those from vending machines, whether the drinks are customisable or not.

The Nutri-Grade system comprises colour-coded grades from A to D, with D containing the highest sugar and/or saturated fat content. The Ministry of Health (MOH) announced the Nutri-Grade mark back in 2019. The move to introduce labelling requirements is part of a national effort to help people keep unhealthy diets in check and prevent diseases such as diabetes.

Nutri-Grade label

EXAMPLES

Mandatory labelling			
Advertising prohibition			
A	B	C	D
<ul style="list-style-type: none"> Water Unsweetened teas Skimmed milk Unsweetened plant based milks 	<ul style="list-style-type: none"> Low fat milks Diet drinks Low sugar and fat 3-in-1s 	<ul style="list-style-type: none"> Full fat milks Flavoured milks Isotonic drinks 3-in-1s 	<ul style="list-style-type: none"> Soft drinks Energy drinks 100% juices Juice drinks High fat 3-in-1s
Example 1 250ml drink with no sugar and no saturated fat <ul style="list-style-type: none"> 0g/100ml sugar (no sweeteners) 0g/100ml saturated fat 	Example 2 250ml drink with no sugar, but contains sweeteners <ul style="list-style-type: none"> 0g/100ml sugar (with sweeteners) 0g/100ml saturated fat 	Example 3 250ml lower sugar drink that has medium saturated fat <ul style="list-style-type: none"> 4g/100ml sugar 1.5g/100ml saturated fat 	Example 4 100ml higher sugar drink that has no saturated fat <ul style="list-style-type: none"> 12g/100ml sugar 0g/100ml saturated fat

NOTE: The label design may be subject to changes.

Source: HEALTH PROMOTION BOARD, SINGAPORE
STRAITS TIMES GRAPHICS



Rules and regulations can also be implemented to regulate inaccurate or misleading information to help firms and consumers make better and more informed decisions. In Singapore, there is a Code of Advertising Practice set by Advertising Standards Authority of Singapore (ASAS) that regulates advertising e.g., those posted by skin care and beauty centres.

Advantages of Rules and Regulations

Rules and regulations are legally binding, and they are mandatory for consumers and producers to comply. Thus, such measures are direct and fast in achieving the socially optimal outcome when necessary.

Limitations of Rules and Regulations

Rules and regulations entail high administration costs to ensure compliance. Manpower is needed to be employed to conduct checks regularly. For example in the case of mandatory nutrition labelling where the producers are the providers of information, checks would need to be conducted to ensure accuracy of information otherwise there is an incentive for producers to hide information away. Reporting and collation of data will also require manpower to ensure the maximum welfare of the society is attained.

To strike a balance between being overly restrictive and being lax in their enforcement requires substantial amount of research and deliberation by government officials. Lastly, rules and regulations take time to be formulated. In addition, as the circumstances change, such rules and regulations need to be reviewed regularly, thus incurring even higher costs in the years ahead.



Key Question 6: How does the non-provision of public goods lead to market failure?

3.3. Non-Provision of Public Goods and Government Intervention

3.3.1. Non-Provision of Public Goods

Public goods are usually goods provided and consumed on a collective basis, i.e., once provided, it would confer benefits to all e.g., national defence. It is difficult to imagine providing national defence to a particular district of a country and not the others. Other examples of public goods are tornado sirens or tsunami warning systems. Once built, it confers benefits to everyone in the region/country as they can be warned of an impending tornado or tsunami.

A public good has 3 distinctive features:

- 1) **non-rivalry**
- 2) **non-excludability and**
- 3) **non-rejectability.**

As a result of these features, public goods will not be provided by the free market and there is complete market failure.

1) **Non-rivalry in consumption**

This means that the consumption of the good by one party does not reduce the amount available to others. Private goods like chocolates and cars exhibit rivalry in consumption, as one person's consumption of chocolates and cars will reduce the quantity available to another person.

However, in the case of a public good, national defence- when a person enjoys the benefits of being protected by his country's defence force, it does not prevent anyone else in his country from enjoying the same benefit at the same time. His consumption of military defence does not reduce that amount available for others in his country.

How does this lead to market failure?

As the supply of the public good, i.e. national defence, once provided, is not depleted by an additional user, this means that the marginal cost of providing the public good to *an additional user* is zero (i.e. $MC = 0$) as there is no additional cost incurred in providing the good for the additional consumer once the good has been produced.

The socially optimal level occurs where P (price) $= MC$ (marginal cost). This means that price must be equal to 0. However, since the profit maximising firm will not charge $P = \$0$, the social optimal level of output will not be achieved. Therefore, there is complete market failure.



2) Non-excludability

This occurs when there is no effective way to restrict the benefits of public goods to only those who pay for them. Once the good is provided, it is available to all regardless of whether or not the individual pays for the public good.

A private good, e.g., a car, is excludable as non-payers can be excluded from using the good while a public good like national defence is non-excludable. For example, once a defence force has been established, there is no way one can restrict protection only to a certain group of people in the country e.g., those who pay taxes.

How does this lead to market failure?

This feature of *non-excludability* means that users can enjoy the benefits from a public good even if they do not pay for it. Therefore, consumers have no incentive to pay. Knowing that they do not have to pay to enjoy the consumption of the good, consumers will conceal their demand from the producers and not pay for its consumption. In other words, they want to take a “free ride”. This is known as the free-rider problem.

Not being able to charge a price for this public good and hence make any profits from it, the profit-maximising producers will not produce/provide this good. Therefore, there is complete market failure.

Thus, when goods exhibit the characteristics of non-rivalry and non-excludability, the free market will not provide them at all. Hence, public goods will only be provided by the government.

3) Non-rejectability

Non-rejectability can be defined as the inability of consumers to refuse the consumption of a good once it has been produced.

For example, when a certain level of deterrence to external threats is created by the provision of national defence such as a nuclear defence system, a person residing in that country will not be able to refuse the safety created even if he wants to.

The collective supply of a public good for all means that it cannot be rejected by people.

Note:

Always explain the characteristics of non-rivalry and non-excludability when explaining the non-provision of public goods when left to the free market.

Non-rejectability is a third and additional characteristic that can be used when relevant.



How would questions that require you to make use of this understanding look like?

Have a look at the following question.

*This question corresponds to **Sect A Qn 3f** of your Microeconomic Objectives and Policies Tutorial package.*

Section A CSQ 3

- (f) Explain why there is a need for government intervention in the markets for public goods, and comment on whether you believe government intervention should be confined to public goods. [8]

3.3.2. Government Intervention to Deal with Non-Provision of Public Goods

Direct Provision

Due to the characteristics of both non-rivalry in consumption as well as the non-excludability of public goods as explained above, public goods will not be produced at all in the free market because no profit-maximising producer will be willing to produce them.

However, public goods are deemed to be essential.

Hence, the government needs to provide the goods to make them available to the public.



Key Question 8: How does the lack of equity lead to a distributional issue?

4. INEQUITY AND INCOME INEQUALITY

Recall that the government has two microeconomic objectives namely, efficiency and equity. A market may achieve allocative efficient through the use of the price mechanism but still face inequity in the distribution of income and wealth. Thus, even if the market allocated resources efficiently, government will need to intervene in the market if there is a lack of equity.

The market mechanism is based on the ability and willingness to buy.

As the distribution of goods by the price mechanism is based on the dollar vote, the unequal distribution of income and wealth could mean that a disproportionately small amount of the country's resources would be devoted to producing luxuries for the rich at the expense of necessities for the poor.

This can widen the gap between the haves and the have-nots even though there could be a greater need for the basic necessities among the poor. An example will be the allocation of more resources for advancement of medical technology in cosmetic treatments rather than investing in research for cheaper alternatives in AIDS treatment or providing for basic healthcare in poor countries.

Equity is a normative concept, i.e. it is subjective – what is fair to one person may not be fair to another.

For example, some may think that everyone should earn equal wages regardless of the job one possesses, but others may think that higher wages should be awarded to those who are better-skilled or do more hazardous jobs.

We can also discuss equity in policy making. The same policy approach can be supported for reasons of equity by one group and, at the same time, rejected for reasons of inequity by another group.

For example, cigarettes have negative externalities causing the social cost to be higher than private cost. The cigarette tax makes smokers pay the full social cost of smoking and increases allocative efficiency. However, a cigarette tax is also highly regressive. It takes a bigger percentage of income from low-income earners.

It is important to understand that value judgements come into play whenever the distribution of income, wealth and goods and services in society is discussed.



Key Question 9: What are the causes of inequity?

4.1. Causes of Inequity

Income inequality can result from a number of social, economic and political factors.

a) Factor endowment

Wages are part of income. Since wages are determined by demand and supply of labour, any factors that affect the demand for and supply of labour will affect the wage rate. These factors

TIPS

Equity should be discussed as a **distributional issue** and **not to be considered as a cause of market failure.**

Equitable distribution (equity) does not **mean equal distribution (equality).**

It simply means fair distribution.



include differences in productivity levels, qualifications and education level of workers. Generally, workers who receive higher wages tend to be those whose labour services are in high demand relative to supply.

For example, the demand for workers who are productive and possesses good qualifications is higher relative to workers who are less productive and who possess lower qualifications. On the supply side, the supply of workers who are productive and possesses good qualifications is more limited than the workers who are less productive and who possess lower qualifications.

Therefore, the wages of workers who are productive and possesses good qualifications tend to be higher than those who are less productive and with lower qualifications.

As income includes interest, rent and profits, people who own land and bank deposits will earn rent and interest in addition to wages. Hence, wealth endowment also affects income distribution.

b) Demand for the output produced by the factors

The demand for factors of production is a derived demand. Industries with a higher demand for their goods and services demand more labour. Therefore, wages will be higher in such industries compared to industries which see a declining demand for their goods and services.

Individuals with higher income thus tend to be those whose labour services are in high demand, usually as a result of growth of certain industries.

c) Globalisation

Globalisation results in greater trade flows, strengthening a country's export sector as related industries gain access to larger foreign markets. On the other hand, her domestic market-oriented sector may be subjected to greater foreign competition leading to unemployment among the workers involved in these sectors. This may lead to an income gap between the people who work in the export and domestic market-oriented sectors.

Globalisation also widens the gap between high-skill and low-skill labour. Highly skilled and well-qualified workers tend to command higher wages as they are much sought after internationally.

With increased globalisation, the influx of cheap foreign labour into a country tends to depress wages of low-skill labour, worsening the income inequality.

d) Government policy

In recent years, some governments reduce the personal income tax and corporate tax rates in a bid to woo foreign talent and investors. This further worsens the income and wealth inequality.

The government's active promotion of economic growth often leads to unequal gains as the rich possess the bulk of the factors of production compared to the poor.

Measurement of Income Inequality

The Lorenz Curve is a graphical representation of inequality. The curve plots the percentage of a nation's income that is enjoyed by the lowest 'x' percent of earners the population. The axes are



labelled 'cumulative'. For example, the lowest 15% of earners in the population would also include the lowest 10%.

The diagonal on the Lorenz Curve represents complete equality (e.g. 50% of the population holds 50% of the income). Total inequality would see a curve running along the horizontal axis, from left to right, and then up the vertical. The further the Lorenz Curve bows away from the diagonal, the greater the degree of inequality.

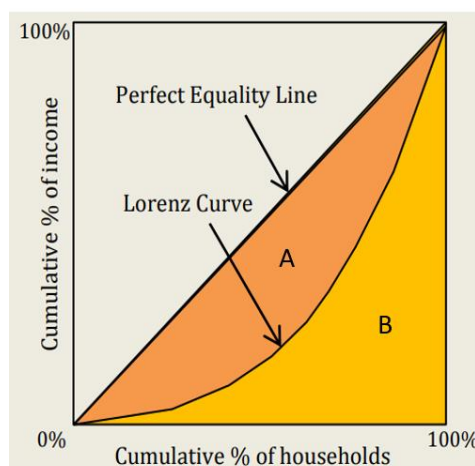


Figure 20: Lorenz Curve (Source: www.singstat.gov.sg)

One of the frequent measurements of income equality or the distribution of income within a country is the Gini coefficient. The Gini coefficient is a numerical representation of inequality, derived from the Lorenz Curve.

$$\text{Gini Coefficient} = \frac{\text{Area A}}{(\text{Area A} + \text{Area B})}$$

The Gini coefficient can range from 0 to 1; it is sometimes multiplied by 100 to range between 0 and 100. A low Gini coefficient indicates a more equal income distribution while a higher Gini coefficient indicates greater unequal income distribution.

A Gini coefficient of 1 indicates a most unequal economy in which a single person receives 100% of the total income in an economy and the remaining people in the economy receive none. On the other hand, a Gini coefficient of 0 corresponds to a perfect equality in income distribution in the economy for every person in the economy receives the same income. In Singapore, while the Gini coefficient grew between 2003 and 2014, in recent years it fell slightly from 0.464 in 2014 to 0.433 in 2023. Hence, between 2014 and 2023, the income inequality in Singapore was lowered.

[Refer to Annex Section 6.7 to see how the Gini Coefficient in Singapore changed over the years.]



Key Question 10:

What can the government do to deal with inequity?

4.2. Government Intervention to Deal with Inequity

The government can undertake measures to tackle the problem of income inequality (unequal distribution of income and wealth) as this gives rise to the problem of inequity (inequitable outcomes).

a) Progressive Tax System

How it works

If taxes are to be used as a means of achieving greater equality, the rich must be taxed proportionately more than the poor. A progressive tax system is a tax system by which the tax rate increases as the taxable amount of personal income increases i.e., as personal income increases, the percentage of their income paid in the form of tax increases.

Advantages of Progressive Tax System

As marginal tax rates are progressively higher as income rises, a progressive tax system automatically takes away a higher percentage of a person's income as his income rises.

For instance, in Singapore, an individual's annual income of below \$20,000 is tax-free. As his taxable income rises by \$10,000, this is taxed at 2%, while the following \$10,000 is taxed at 3.5% and so on. This has the effect of narrowing the gap between the rich and the poor while still allowing the higher income group to enjoy the monetary incentives of providing their labour services.

Limitations of Progressive Tax System

Progressive direct taxation takes away a higher proportion of income from the rich. In the process, it helps to reduce the disposable incomes of the rich. But no taxes, however progressive, can increase the income of the poor unless it is re-distributed to the lower income group in the form of subsidies and rebates e.g., utilities rebates.

However, though a progressive tax system can help to reduce the inequality gap, countries may not be willing to raise progressive tax rates for fear of a brain drain. A brain drain will see the highly skilled workers in a country moving abroad in search of jobs which reward them with higher disposable income due to the lower tax rates available abroad.

Higher progressive tax can also have some negative effects on the ability to attract foreign talent & investments. These foreign talents & investments are important in stimulating the economic growth of a country (more to be covered in JC2). Moreover, work effort of the labour force may be adversely affected since higher income earners have to pay more marginal tax rate. People may feel less motivated to strive for promotion or work harder as a greater proportion of their additional income will be taken away in tax.



b) Transfer Payments/Subsidies

How it works

Government transfer payments can take the form of cash benefits given to supplement individual's income e.g., child benefits, retirement pensions and unemployment benefits.

The government can also subsidise goods and services either by providing it free of charge to lower income group through financial aid schemes e.g., subsidised education, public housing grants and utility rebates. They can also provide it at a reduced price e.g., medical treatment at polyclinics in Singapore.

Advantages of transfer payments/ subsidies

Subsidies may help to reduce inequality if more are given to the poor than the rich.

Limitations of transfer payments/subsidies

Sometimes, corruption within state governments may result in citizens (especially in developing countries) being unable to receive their share of the subsidy.

It may also result in over-reliance of lower income groups on the government for hand-outs which may not be healthy for the economy in the long term.

c) Minimum Wage Legislation

How it works

Minimum wage legislation sets the lowest wage that employers must pay their employees. It is implemented to protect low-wage employees and to prevent the exploitation of workers.

Recall from Theory of Demand and Supply:

A minimum wage is a price (wage) floor set in the labour market. In Fig. 21 below, the equilibrium wage of labour (OW_e) is deemed by the government to be too low. This is seen as a cause of a widening income inequality in the country. Hence, a minimum wage of OW_f is set above the equilibrium wage OW_e to protect workers.

Advantages of Legislation

This minimum wage is important to help bridge the income inequality gap between workers especially if the price floor is set for low-skill workers employed in industries.

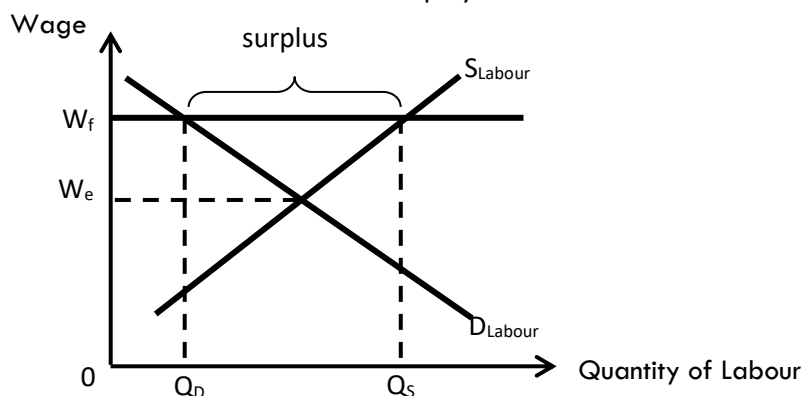


Figure 21: Effect of a Minimum Wage



Limitations of Legislation

When a minimum wage is set, it results in a surplus of labour or unemployment of $Q_D - Q_S$ in the labour market. This is because employers may be less willing to hire labour at the minimum wage of OW_f as it may affect their profitability. As a result, there will be an increase in unemployed labour in the workforce. This can be undesirable to the economy's health as actual output is less than potential output.

Singapore Experience: The Progressive Wage Model

Instead of legislating a national minimum wage in Singapore, the government has adopted a Progressive Wage Model (PWM) which was first introduced in 2012.

Developed by tripartite committees consisting of unions, employers and the government, the PWM helps to uplift low-wage workers in the cleaning, security and landscape sectors. PWM helps to increase wages of workers through upgrading skills and improving productivity. It is implemented via government levers in the cleaning, security and landscape sectors.

Wages in these sectors had stagnated due to widespread cheap sourcing. The low wages in turn resulted in high turnover and labour shortages. The PWM benefits workers by mapping out a clear career pathway for their wages to rise along with training and improvements in productivity and standards. At the same time, higher productivity improves business profits for employers. Service buyers also enjoy better service standards and quality.

The model was first made mandatory for the cleaning sector in 2015, and it establishes a minimum pay employers have to give out to employees. An example of a PWM Schedule for cleaners is given below.

Progressive Wage Model Schedule for Cleaners for 2023

Group 1: Office and commercial sites e.g. offices, schools, hospitals, medical clinics, condominiums	Group 2: F&B establishments e.g. hawker centres, foodcourts, restaurants	Group 3: Conservancy e.g. town councils, public cleansing
Supervisors ≥ \$1,967	Supervisors ≥ \$1,967	Truck drivers (Class 4/5) ≥ \$2,077
↑	↑	↑
Multi-skilled cleaners / Machine operators ≥ \$1,749	Multi-skilled cleaners / Machine operators ≥ \$1,749	Supervisors / Mechanical drivers ≥ \$1,967
↑	↑	↑
Outdoor cleaners / Healthcare cleaners / Restroom cleaners ≥ \$1,530	Dishwashers / Refuse collectors / Restroom cleaners ≥ \$1,530	Multi-skilled cleaners / Machine operators / Refuse collectors ≥ \$1,749
↑	↑	↑
General / Indoor cleaners ≥ \$1,312	Table-top cleaners ≥ \$1,421	General cleaners / Restroom cleaners ≥ \$1,530
	↑	
	General cleaners ≥ \$1,312	



How is the Progressive Wage Model that Singapore adopts different from a minimum wage?

One difference between a national minimum wage and the PWM is that a national minimum wage would require all businesses in Singapore to pay their workers above the stated level, whether they can afford it or not. The PWM however, is currently only implemented and made mandatory in a number of sectors such as cleaning, security, retail, food services and landscaping.

A second difference is that the PWM considers both employees and employers. Workers' salaries increase when they move up the training "ladder", assuring employers that there is a corresponding increase in productivity. A minimum wage policy on the other hand, is centered mainly on employees and does not focus on increasing productivity.

Adapted from: mom.gov.sg; ntuc.org.sg

d) Education

How it works

In Singapore's Budget 2015, the government introduced the SkillsFuture Credit scheme. This scheme provides Singaporeans aged 25 & above an initial \$500 credit to use on approved courses in areas like Aerospace, Information Technology, Early Childhood Education and courses in Language and Culinary Skills. Though small in the initial amount, this will nevertheless help to offset course fees for Singaporeans who are keen to upgrade their skills. Other programmes such as the Workfare Skills Support scheme (WSS) seek to encourage lower-wage workers to undertake training so that they can be equipped with skillsets that allow them to increase their employability and transit to a better paying job.

Advantages of Education

The perpetuation of inequality in income and wealth can be due to a lack of opportunities to education and training. Education or training can be provided for individuals who wish to pursue higher education level or training. This will give them better opportunities to upgrade their skills and abilities. This will also lead to better allocation of resources in terms of efficiency and equity as individuals who do not have the necessary skills will be able to acquire new relevant skills and increase their employability in the process and move to higher paying jobs.

Limitations of Education

It takes a long time to take effect and it is difficult to measure the success of such a policy.

Education may not always benefit all and may not always lead to higher income. It is still very much dependent on an individual's aptitude and attitude towards education and training as well as transferability of skills learnt to the workplace for high productivity.



How would questions that require you to make use of this understanding look like?

Have a look at the following question.

This question corresponds to Additional Qn 3f of your Microeconomic Objectives & Policies Tutorial package.

Additional Qn 3

- (f) In view of efficiency and equity, discuss whether government intervention in the fossil fuel market does more harm than good. [10]



Key Question 11: What causes government failure?

5. Government Failure

By now, we know that markets can fail and thus there is a need for government intervention.

However, sometimes, by intervening, the government can make the situation worse and may create greater inefficiencies. Government failure occurs when the cost of an intervention exceeds the benefits of intervention and, as a result, worsens resource allocation. It is a scenario where government intervention causes outcomes to be even more inefficient or inequitable as compared to no intervention.

5.1. Reasons for Government Failure

a) Lack of/Poor information

To intervene effectively, the government must possess adequate and accurate information. However, in reality, this may not be the case. For example, when determining the amount of tax to impose, it often faces difficulties in measuring the amount of external costs imposed on third parties. When a tax that is too high is imposed, it may overcorrect the market, causing a bigger deadweight loss compared to if there were no intervention at all. Therefore, any misinterpretation of the optimal outcome in terms of the socially efficient level of output to be consumed/produced, may lead to the formulation of wrong policies and a worse outcome than without intervention.

b) Administrative Costs, Bureaucracy and Inefficiency

The administrative costs of a policy can sometimes be substantial and may contribute to a situation where the policy as a whole, carries costs in excess of the benefits.

To intervene effectively, the government has to set up a government body to deal with market failure. This might impose further strain on the already limited resources the country is endowed with. Moreover, the bureaucratic nature of intervention inhibits fine-tuning of policy solutions and often leads to much slower responses.

Resources could be wasted due to the lack of a profit motive in the public sector. For example, given the opportunity, the private sector may produce more health care than the public sector using the same resources.

c) Unintended Consequences

If governments correct market failures hastily by introducing frequent changes in government policies (reduction and/or increment of tax rates, subsidies, regulatory requirements, etc.), firms may be discouraged from investing.

Consistent and sound government policies are key contributing factors to economic growth. Firms (local and foreign) will be more willing to invest when they face a stable and relatively predictable macroeconomic environment.



Another example is if governments tighten environmental regulations for firms which lead them to locate elsewhere, where regulation is loose or does not exist at all. The net effect may be an increase in the overall damage to the environment.

Raising taxes on goods that are over-consumed may cause consumers to buy them from countries where taxes are lower, thus the policy may not be effective in lowering consumption and may even lead to a reduction of government revenue.

In all these cases of unintended consequences, government intervention has encouraged economic agents to behave in an undesirable way. The intervention has thus distorted the market by creating undesirable incentives.

d) Conflicting Objectives

Governments have numerous economic objectives and these may sometimes come into conflict with each other. For example, government intervention to improve equity frequently distorts economic incentives and may cause inefficiency. The availability of benefits in the form of subsidies might lead to continued existence of inefficient firms. Similarly, consumers who receive welfare benefits might be discouraged from working altogether. This is one case of what is known as the equity-efficiency trade-off.

Political objectives and considerations may also interfere with economic policy making. For example, governments may be tempted to put in place policies which make them popular in the short term but may be economically damaging in the long term. Subsidising a failing industry or setting price ceilings/floors might be popular with those who benefit from these measures but they are not necessarily economically efficient.



How would questions that require you to make use of this understanding look like?

Have a look at the following question.

*This question corresponds to Sect A Qn 4f of your
Microeconomic Objectives & Policies Tutorial package.*

Section A CSQ 4

- (fii) With reference to Extracts 1 and 3, explain two reasons how government intervention might introduce further inefficiencies into the market and comment on how these inefficiencies might differ for different economies. [7]



MARKET FAILURE AND GOVERNMENT INTERVENTION CHECK OUT



Efficiency and equity in relation to markets

- Understand that market efficiency is achieved when allocative efficiency is attained.
- Understand that efficient resource allocation may not result in equitable outcomes.
- Explain inequalities in the distribution of income and wealth and the link to inequity.

Market Failure and its Causes

- Explain the meaning of market failure and the possible causes.
- Explain with diagrams, why the existence of externalities leads to a divergence between private costs/benefits and social costs/benefits and cause the private optimum to differ from the social optimum.
- Explain with diagrams how information failure can cause the divergence between actual and perceived benefits or costs, thus resulting respectively in the under-consumption or over-consumption of a good.
- Understand how the characteristics of public goods affect the decisions made by economic agents and result in the non-provision by the market.
- Understand what is meant by a cost-benefit approach in the context of externalities.

Government Intervention in Markets

- Understand that governments intervene to correct market failures and inequity.
- Explain how governments intervene to correct market failures and inequity. Policy measures including taxes and subsidies, quotas and tradeable permits, joint and direct provision, rules and regulations, public education in achieving efficiency and equity.
- Examine the effectiveness of policy measures by which governments intervene in markets.
- Explain and evaluate the limitations and trade-offs of the policy measures, which can take the form of economic, social or political considerations.
- Discuss how government intervention may result in outcomes to be even more inefficient or inequitable as compared to no intervention because of government failure.



6. Annex

6.1. Healthcare in Singapore

As discussed above, healthcare services are socially desirable and it tends to be under-consumed in any society. In Singapore, several measures have been undertaken by the government to boost the consumption of healthcare in effort to achieve the socially optimal level, and also to ensure that all Singaporeans are assured of affordable basic healthcare.

Our healthcare system comprises public and private healthcare. Private practitioners provide 80% of primary healthcare services while government polyclinics provide the remaining 20%. However, public hospitals provide 80% of the more costly hospital care with the remaining 20% by private hospital care

Good, affordable basic healthcare is available to Singaporeans through subsidised medical services at public hospitals and clinics. Our hospitals and healthcare system will never withhold help to a Singaporean because of financial limitations. Yet our philosophy promotes individual responsibility towards healthy living and medical expenses.

1. Subsidies

- Lower-income patients in Singapore receive more subsidies than the higher-income at these facilities. This was implemented in 2009.
- Patients will still retain their freedom to choose their ward class. Any patient, regardless of whether they are rich or poor, can choose to be admitted to a Class C or B2 ward. They will still be heavily subsidised, but at different rates.
- With subsidies, MEB is internalised by private individuals and MPB is raised to coincide with MSB (refer to section 3.1.6 for in-depth explanation). Society will then be consuming at the socially optimal level.

Evaluation

- Difficulty in estimating the amount of MEB and hence, the amount of subsidy may not allow the socially optimal level of consumption to be achieved. Too much or too little subsidy will still result in allocative inefficiency, which represents a wastage of resources.
- For patients who receive less subsidy, the government has assured that no patient will be denied medical treatment because he cannot afford it. This is good as it will be implemented flexibly and appeals for re-assessment will be considered.
- Moreover, hospitals will rely on income data in the CPF system. A patient's income will be based on his total salary received over the last-available 12-month period. It will not be based on just the last month's pay. This will address the concern about month-to-month differences in pay arising from occasional instances of overtime.
- A problem with heavily subsidised healthcare at public hospitals or polyclinics is that individuals tend to 'over-consume', by going to see the doctor when they are slightly unwell, which results in long-waiting time for those who are really in need of medical treatment. Such problem is also very common in welfare states (in the modern sense) like the United Kingdom and Australia, where the waiting period to see a general practitioner can go as long as 48 hours.

2. Medisave, Medishield Life, Medifund and Eldersshield

- Medisave, a national medical savings scheme, was introduced in April 1984. Medisave helps individuals put aside part of their income into their CPF Medisave Accounts to meet



their future personal or immediate family's hospitalisation, day surgery and certain outpatient expenses.

- Under the scheme, every employee contributes 8-10.5% (depending on age group) of his monthly salary to a personal Medisave account. The savings can be withdrawn to pay the hospital bills of the account holder and his immediate family members.
- To help younger generation cope with rising healthcare cost in supporting their elderly parents, the government has from time to time provided top-ups to the Medisave accounts of the elderly.
- MediShield Life is a basic health insurance scheme, administered by the Central Provident Fund (CPF) Board, which helps to pay for large hospital bills and selected costly outpatient treatments such as dialysis and chemotherapy for cancer.
- Medifund is an endowment fund set up by the Government to help needy Singaporeans who are unable to pay for their medical expenses. Medifund acts as a safety net for those who cannot afford the subsidised bill charges, despite Medisave and MediShield coverage.
- ElderShield is an affordable severe disability insurance scheme which provides basic financial protection to those who need long-term care, especially during old age. It provides a monthly cash pay-out to help pay the out-of-pocket expenses for the care of a severely-disabled person.

Evaluation

- While the above measures are comprehensive as it seems to capture almost everyone, there are some limitations. E.g.: self-employed workers may not contribute or may not contribute sufficiently to Medisave. Hence, should they need to use the money, it may be insufficient.
- While the CPF board pays interest for money placed in the Medisave account, the real value of the money may be eroded by inflation and rising cost of medical treatment.
- Unfortunately, since Medisave takes up a proportion of income (8%-10.5%), it is often insufficient for lower income groups when they face critical illnesses that require huge sums of medical treatment fees. Lower income groups may rely on Medifund, but due to limited government resources, the criteria to be eligible for Medifund tend to be very stringent. Hence, healthcare expenses may still remain a problem for those who are considered to be of lower income group, but not low enough to be eligible for Medifund.

3. Rules and Regulation

- Compulsory vaccinations at birth such as BCG prevent outbreaks of diseases by ensuring that the consumption of such vaccinations is at the socially optimal level.
- To reduce imperfect information, government also forces the hospitals to be more transparent in their operations.

E.g. the hospitals have to be transparent about the cost of medicine, the doctor fee, the cost of equipment to prevent patients to be charged excessively by unethical doctors. Receipts of payments will show a breakdown of charges. This is done through legislation. The Ministry of Health publishes on its website total operation fees for a variety of procedures. In 2018, the Ministry of Health set up a committee to set fee guidelines for common medical procedures.

Evaluation

- Rules are blunt instruments but they are straightforward. In the above examples, such legislations are necessary in order to prevent patients from being exploited due to imperfect information.



- Easy to administer since it should be given to all new births. However, government must ensure the stock of such vaccines is available.
- However, for subsequent vaccinations, it may be difficult to ensure that all infants are given the necessary vaccinations. When discovered, it may be too late as they would have suffered from some illnesses.

4. Other Long Term Measures

- To educate the public through mass media and carry out campaigns. Teach citizens the importance of health and that it is a social responsibility to stay healthy.
- To carry out R&D to discover more effective vaccines to stop these diseases from spreading and which are cheap for everyone to afford such vaccination.

Evaluation

- This is a very long process. In addition, it may be costly to finance such programmes. These serious epidemics may be too serious to wait for these long run effects to take place.

6.2. Should Healthcare Provision be left to the Market?

A Case of Multiple Market Failures

In the UK, the National Health Service provides free hospital treatment, a free general practitioner service, and free prescriptions for certain categories of people. Their marginal cost to the patient is thus zero. Of course, these services use resources and they thus have to be paid for out of taxes.

But why are these services not sold directly to the patient, thereby saving the taxpayer money? There are, in fact, a number of reasons why the market would fail to provide the optimal amount of health care.

Difficulty of affording treatment

This is a problem connected with the distribution of income. Because income is unequally distributed, some people will be able to afford better treatment than others, and the poorest people may not be able to afford treatment at all. On grounds of equity, therefore, it is argued that health care should be provided free – at least for poor people.

The concept of equity that is usually applied to health care is that of treatment according to medical need rather than according to the ability to pay.

Difficulty of predicting one's future medical needs

If you were suddenly taken ill and required a major operation, it could be very expensive indeed for you if you had to pay. On the other hand, you may go through life requiring very little if any medical treatment. In other words, there is great uncertainty about your future medical needs. As a result it would be very difficult to plan your finances and budget for possible future medical expenses if you had to pay for treatment. Medical insurance is a possible solution to this problem, but there is still a problem of equity. Would the chronically sick or very old be able to obtain cover, and if so, would they be able to afford the premiums?



Externalities

Health care generates a number of benefits **external** to the patient. If you are cured of an infectious disease, for example, it is not just you who benefits but also others, since you will not infect them. In addition if you have a job you will be able to get back to work, thus reducing the disruption there. These external benefits of health care could be quite large.

If sick people have to pay the cost of their treatment, they may decide not to be treated – especially if they are poor. They may not take into account the effect that their illness has on other people. The market, by equating **private** benefits and costs, would produce too little health care.

Patient Ignorance

Markets only function well to serve consumer wishes if the consumer has the information to make informed decisions. For many products that we buy, we have a pretty good idea how much we will like them. In the case of health care, however, 'consumers' (i.e. patients) may have very poor knowledge. If you have a pain in your chest, it may be simple muscular strain, or it may be a symptom of heart disease. You rely on the doctor (the *supplier* of the treatment) to give you the information: to diagnose your condition. Two problems could arise here with a market system of allocating health care.

The first is that unscrupulous doctors might advise more expensive treatment than is necessary; they might even have an agreement with certain drugs companies that they will try to persuade you to buy an expensive branded product rather than an identical cheaper version.

The second is that patients suffering from the early stages of a serious disease might not consult their doctor until the symptoms become acute, by which time it might be too late to treat the disease, or very expensive to do so. With a free health service, however, a person is likely to receive an earlier diagnosis of serious conditions.

Oligopoly

If doctors and hospitals operated in the free market as profit maximisers, it is unlikely that competition would drive down their prices. Instead they might collude to fix standard prices for treatment, so as to protect their incomes. Even if doctors did compete openly, it is unlikely that consumers would have enough information to enable them to 'shop around' for the best value.

We have to be careful: to argue that the market system will fail to provide an optimal allocation of health care resources does not in itself prove that *free provision* is the best alternative. For example, with no charge for GP appointments it is likely that some patients will consult their doctors over trivial complaints.

In the USA there is much more reliance on *private medical insurance* with only very poor people getting free treatment. Alternatively, the government may simply *subsidise* health care, so as to make it cheaper rather than free. This is the case with prescriptions and dental treatment in the UK, where many people have to pay part of the cost of treatment. Besides, the government can *regulate* the behaviour of the providers of health care, to prevent exploitation of the patient. Thus only people with certain qualifications are allowed to operate as doctors, nurses, pharmacists, etc.

Source: John Sloman, Alison Wride, *Economics*, 7th Edition

**Questions:**

1. If health care is provided free, the demand is likely to be high. How is this high demand dealt with in the case study? Is this a good way of dealing with it?
2. Can you identify the different sources of market failure in the case study?
3. What are the advantages and disadvantages of the above policies implemented?
4. Consider what alternative policies the government could adopt to tackle the market failure.
5. Evaluate the effectiveness of the policies suggested.



6.3. Dealing with Traffic Congestion in Singapore

1. Introducing Electronic Road Pricing (ERP)

In September 1998, all vehicles in Singapore have been fitted with an in-vehicle unit (IU). Every journey to congested areas made requires the driver to insert a smart card containing pre-paid units into the IU. On specified congested roads or highways, during specified timings, overhead gantries read the IU and deduct the appropriate charge from the card. If a car does not have sufficient funds on its smart card, the car's details are relayed to a control centre and a fine is imposed.

To achieve the socially optimal volume of traffic, motorists must pay the full or the true cost of undertaking a car journey. Under a road-pricing system, each motorist would pay a tax varying according to the amount of congestion on the road.

Evaluation:

A key strength of the system is that it is fair, convenient and reliable. Charges are based on usage so those who contribute more to the congestion pay more. Those who use the roads less frequently or who travel during non-ERP hours will pay less or not need to pay at all. It is convenient and fully automated. Moreover, there is no risk of human error since human enforcement is not required.

It is also specific and appropriately targeted directly at the externality problem, assuming that we can measure and monitor the amount of congestion on a particular road. The "road price" can then be set just at the right level to induce socially desirable decisions by the motorists. ERP has been effective in maintaining an optimal speed range of 45 to 65 km/h for expressways and 20 to 30 km/h for arterial roads.

For this system to be effective, it should be implemented on all roads so that drivers do not seek unregulated roads to avoid charges and cause congestion in other roads. The introduction of such a comprehensive system, however, would be enormously expensive and complicated because there are so many entry points, all of which need to be tagged. In addition, a key stumbling block for this measure is public acceptance and the regressive effect on the less-well off. Opponents of congestion pricing argue that it entails paying with money, rather than with time. Drivers pay a flat rate regardless of their income, as opposed to a time delay, which would have posed a heavier burden on those with higher incomes and higher opportunity costs of time. Hence congestion pricing may be viewed as favouring those who are well-off.

2. Managing car ownership

In 1990 a quota system for new cars was established. The government decides the total number of cars that the country should have, and issues just enough licences each month to maintain that total. These licences (or 'Certificates of Entitlement') are for ten years and are offered at auction. In Singapore, a Certificate of Entitlement (COE) has to be purchased before one can own a car.

The number of COEs allocated per month is governed by the vehicle quota system, whereby the Land Transport Authority determines the number of new vehicles allowed for registration after taking into account prevailing traffic conditions and the number of vehicles taken off the roads permanently each month. The price of COE is then determined by the market under the COE open bidding system. The cost of COE, together with other upfront ownership taxes and fees, makes owning a car a very expensive proposition in Singapore. This policy reduces the number of car owners in Singapore to be closer to the socially optimal level.

**Evaluation:**

Relying on ownership measures to tackle congestion has its limitations. Congestion, after all, is due to car usage, and not the mere possession of cars. As such, ownership measures are often regarded as a blunt instrument. It cannot manage localised congestion unless car ownership is curbed to a very large extent. Beyond a certain level, heavy ownership costs are an inefficient way of managing congestion.

Another problem is that high car ownership costs may have the perverse effect of increasing car usage. Once a car is bought, drivers, having paid heavily upfront for a car with limited period for use, are likely to use very intensively and drive as much as they can.

3. Improving public transport system

The government of a country can also improve public transport in terms of accessibility, convenience, affordability and efficiency to induce people to use public transport as substitute for cars. For a compact city-state like Singapore, public transport must be the centrepiece of its land transport system. High reliance on public transport is key to managing congestion and preserving a high quality urban environment.

The Singapore government has implemented a number of policies to encourage the use of public transport. It includes:

- More MRT lines and investment on trains to improve the ease of taking public transport. Trains are designed to be more comfortable, clean, and frequent. Most stations are air-conditioned.
- Introduce more bus routes and ensure a cheap and reliable bus service, serving all parts of the island. Fares are regulated by the Public Transport Council. Premium buses are offered to provide greater comfort and express service at higher fares.

Evaluation:

While the measure requires high government expenditure, it is a necessary move to attract commuters to switch to public transport. However, as society becomes more affluent, there may not be much impact on the demand for private transport and this poses a challenge to the government to keep up with higher standards for public transport.

4. Providing Information

Traffic cameras on expressways: EMAS is an intelligent incident management system that monitors and manages traffic along expressways, including the CTE tunnels. It deters congestion and implements appropriate action plans. EMAS provides motorists with updated traffic information on incidents so as to mitigate its effects. By providing real-time traffic alerts, EMAS allows early detection and quick clearance of accidents and breakdown vehicles. The overall result is a safer and more pleasant journey for motorists. There are also live traffic updates on Land Transport Authority (LTA) website, with real time images of highways that are frequently congested. In recent years, smart phone apps by LTA are also available for free for convenience of drivers to check on traffic conditions.



6.4. A Case of Negative Externalities- Environmental Degradation

From our discussion, it can be seen that externalities, whether positive or negative, are often not factored into the cost considerations of private producers and consumers in their pursuit of self-interest.

However, an issue that has become increasingly important relates to the destruction of the environment in society's pursuit of its material wants. Many economic activities do not just generate negative externalities but also result in the destruction of the natural environment.

We see this manifested in many of our current global environmental problems such as global warming, ozone depletion, deforestation that result in floods and droughts.

For example, factories may dump their wastes into nearby rivers, polluting the water without taking into account third parties such as residents in those areas for whom the river plays an important part in their way of life. The pollution can also destroy the fish stocks and the livelihoods of fishermen as well as cause damage to the ecosystem.

Another example is that of plantation owners who engage in slash-and-burn activities. This not only pollutes the air and releases greenhouse gases but also destroys large tracts of forest which compounds the problem of global warming.

It is clear that, left on its own, the free market sometimes fails to adequately protect the environment. The main reasons for this market failure are as follows.

- *Externality* is a major issue as the cost of misusing the environment is mainly incurred by society while the benefits accrue to private individuals. Over-production/consumption of goods occurs as the socially optimal output level should be lower due to the high external cost. But, since no one owns environmental resources such as air and hence, property rights are not assigned, it is difficult to stop activities of producers or consumers that contribute to pollution.
- People are generally *ignorant* of the external costs of the activities that lead to environmental damage. Even if they are aware of environmental issues and problems, they may not have the inclination or knowledge to reduce the negative effects of their activities.

Rules and regulations to curb undesirable activities (Environmental Control)

Excessive logging, over-fishing and dumping of industrial wastes are all undesirable economic activities as they contribute to global warming, pre-mature depletion of natural resources and harm marine life respectively. To reduce these harmful activities, the governments can impose rules and regulations to prevent the firms from producing at more than socially desirable level of output.

For example, the Ministry of Forestry in Indonesia issues permits to firms in the logging industry to prevent the destruction of rich forests and unique wildlife.

Another example is EU's Common Fisheries Policy (CFP) that aims to restore fish stocks in EU waters. In the decades leading up to the CFP reform, overfishing had left many fish stocks in EU waters exploited unsustainably and, in some cases, vulnerable to collapse. The fishing industry often suffered from lower yields and lower profits than would have been possible with more effective fisheries management.



The new CFP included a legally binding commitment to end overfishing by 2020 at the latest, so that the total weight of a fish population—can be restored and maintained above sustainable levels. In part, to tackle the problem of fishermen dumping the unwanted fish, fishermen are now changing how they work and their equipment to avoid catching fish that are too small or species they do not want. Previously, around a quarter of catches used to be thrown back in the sea and most of those fish simply died. Accidental catches count against quota but this issue can be reduced with specially selected nets. Increasing selectivity is helping to boost profits fishermen fulfil their quota with more valuable products and that in turn brings them more income.



6.5. Climate Change Conferences

The Kyoto Protocol

In 1992, the UN Framework Convention on Climate Change (UNFCCC) was adopted with the main purpose of tackling the problem of global warming. However, with the continual rise in greenhouse gas emission levels, a firm and binding commitment was needed to convince businesses, communities and individuals to act on climate change. This gave rise to negotiations on a Protocol.

After two and a half years of intense negotiations, the Kyoto Protocol was adopted on 11th December 1997. The Protocol shares the objectives of the Convention but a major distinction lies in the fact that while the Convention encourages developed countries to stabilise greenhouse gas emissions, the Protocol commits them to do so.

1. What is the Kyoto Protocol about?

The Kyoto Protocol is generally seen as an important first step towards a truly global emission reduction regime that will stabilise greenhouse gas concentrations at a level which will avoid dangerous climate change. Countries that ratify this protocol commit to reducing their emissions of carbon dioxide and five other greenhouse gases or engaging in emissions trading if they maintain or increase emissions of these gases. As of 17th April 2008, the Kyoto Protocol covers 179 countries and 1 regional economic integration organisation (the European Economic Community) with the total percentage of emissions from Annex A countries, mainly the developed ones, amounting to 63.7%.

The Protocol's major feature is that it has mandatory targets on greenhouse-gas emissions for the world's leading economies which have accepted it. However, the degree of commitment varies between countries, with greater responsibility placed on developed nations.

Two main reasons for this differentiated responsibility are:

- (1) Developed countries can easily pay the cost of cutting emissions;
- (2) Developed countries have historically emitted larger amounts of greenhouse gases per person than in developing countries.

As a result of the Kyoto Protocol, governments have enacted policies to meet their commitments. In addition, a carbon market has been created and more businesses are adopting environmentally friendly measures in their attempt to uphold corporate social responsibility. The first commitment period of the Kyoto Protocol expires in 2012.



Doha Amendment

In Doha, Qatar, on 8 December 2012, the “Doha Amendment to the Kyoto Protocol” was adopted.

The amendment included:

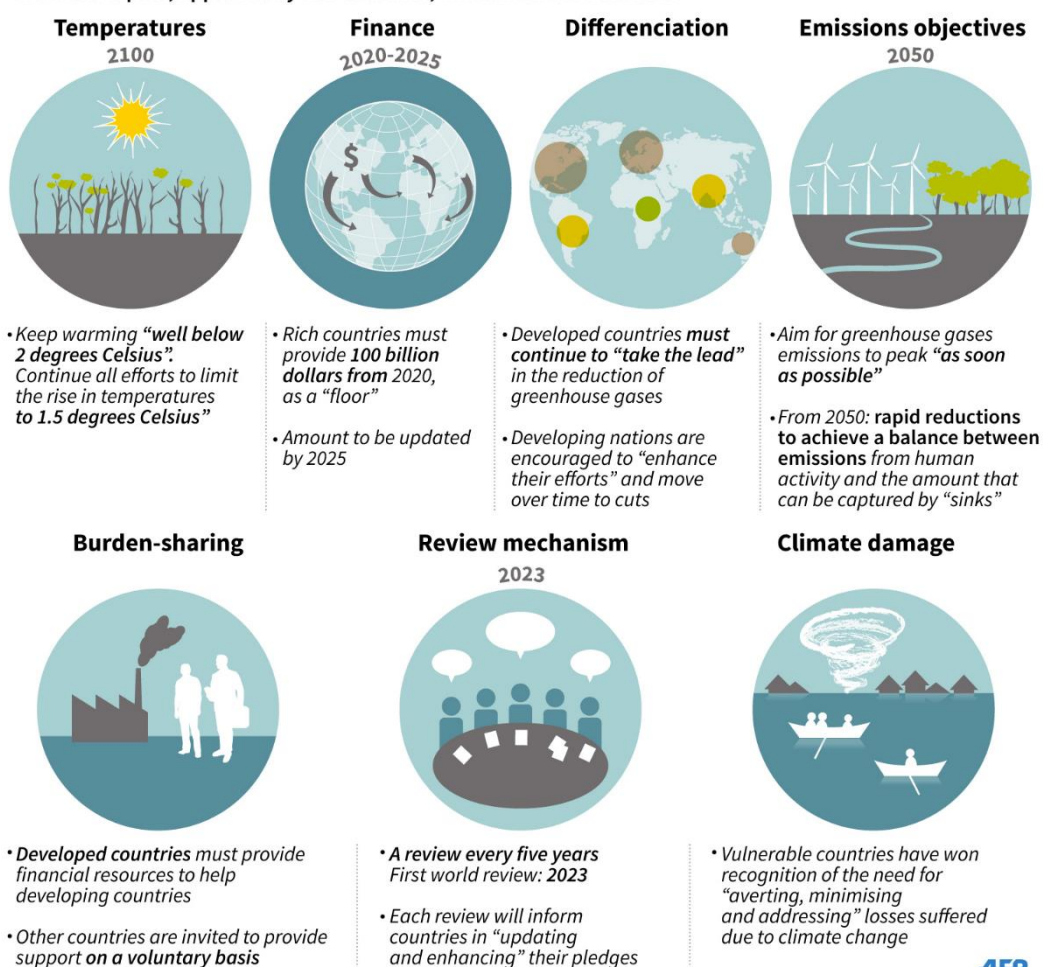
- New commitments for Annex I Parties to the Kyoto Protocol who agreed to take on commitments in a second commitment period from 1 January 2013 to 31 December 2020;
- A revised list of greenhouse gases (GHG) to be reported on by Parties in the second commitment period; and
- Amendments to several articles of the Kyoto Protocol which specifically referenced issues pertaining to the first commitment period and which needed to be updated for the second commitment period.

During the first commitment period, 37 industrialized countries and the European Community committed to reduce GHG emissions to an average of five percent against 1990 levels. During the second commitment period, Parties committed to reduce GHG emissions by at least 18 percent below 1990 levels in the eight-year period from 2013 to 2020.

The Paris Agreement

The Paris climate agreement: key points

The historic pact, approved by 195 countries, will take effect from 2020

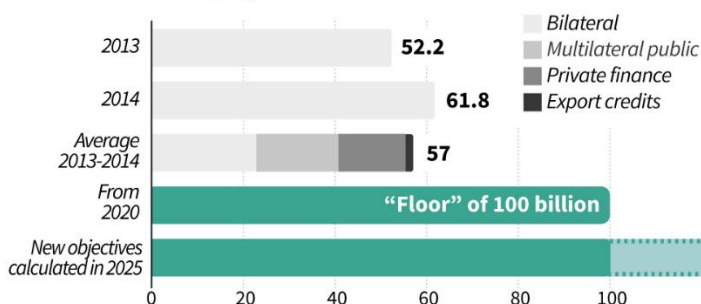


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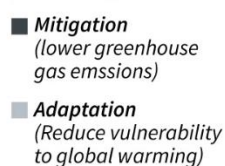
100 billion dollars per year to fight climate change COP21

► Aid for developing countries to fight the effects of climate change In billions of dollars per year



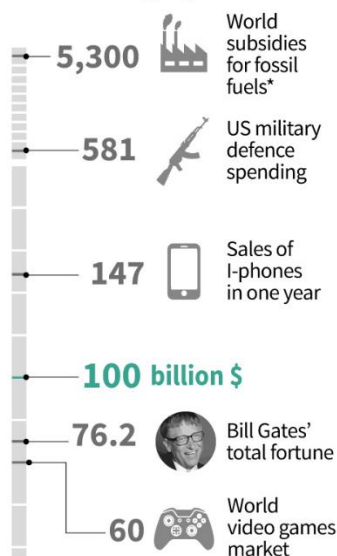
► Mitigation versus adaptation

Finance destined for programmes (2013-2014), in %



► Developed countries must significantly increase adaptation finance

► Comparisons In billions of \$ per year

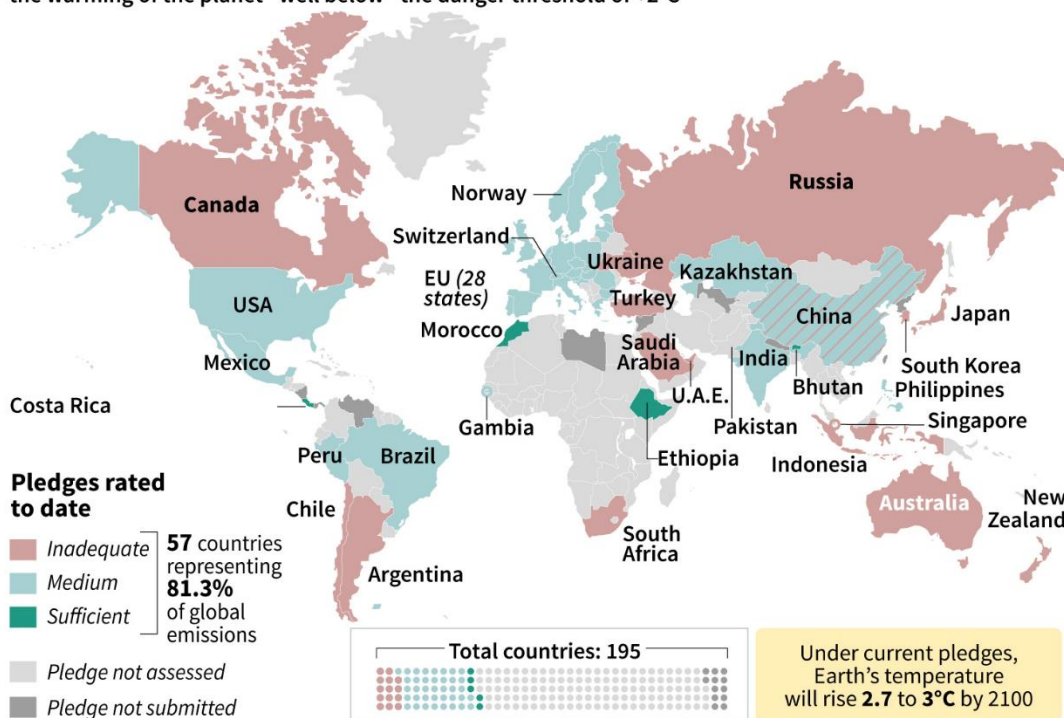


*IMF

Source: OECD AFP

Contributions to cutting greenhouse gas emissions

Pledges so far will not make it possible to attain the COP21 objective of limiting the warming of the planet "well below" the danger threshold of +2°C



Source: Climate Action Tracker, Nov 30

*emissions registered in 2010, excluding land use, land use change and forestry (LULUCF)

AFP



2021 United Nations Climate Change Conference (COP26)

COP26 concluded on 13 November 2021 with the Glasgow Climate Pact, which calls on 197 countries to report their progress towards more climate ambition in 2022, at COP27, set to take place in Egypt. The pact also firms up the global agreement to accelerate action on climate this decade.

Halt deforestation by 2030

One of the biggest announcements was that leaders from over 120 countries, representing about 90 per cent of the world's forests, pledged to halt and reverse deforestation by 2030, the date by which the Sustainable Development Goals (SDGs) to curb poverty and secure the planet's future are supposed to have been achieved.

Methane Pledge22

A methane pledge, led by the United States and the European Union, by which more than 100 countries agreed to cut emissions of this greenhouse gas by 2030. Meanwhile, more than 40 countries – including major coal-users such as Poland, Vietnam and Chile – agreed to shift away from coal, one of the biggest generators CO₂ emissions.

Limiting global warming to 1.5 degrees Celsius

The private sector also showed strong engagement with nearly 500 global financial services firms agreeing to align \$130 trillion – some 40 per cent of the world's financial assets – with the goals set out in the Paris Agreement, including limiting global warming to 1.5 degrees Celsius.

Climate Cooperation between US and China

The United States and China pledged to boost climate cooperation over the next decade. In a joint declaration they said they had agreed to take steps on a range of issues, including methane emissions, transition to clean energy and decarbonization. They also reiterated their commitment to keep the 1.5C goal alive.

Green Transport

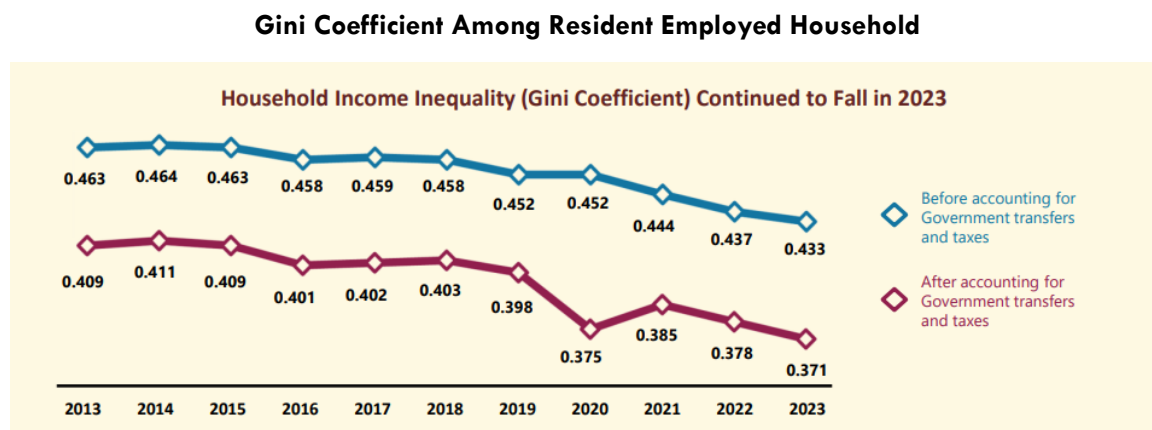
More than 100 national governments, cities, states and major car companies signed the Glasgow Declaration on Zero-Emission Cars and Vans to end the sale of internal combustion engines by 2035 in leading markets, and by 2040 worldwide. At least 13 nations also committed to end the sale of fossil fuel powered heavy duty vehicles by 2040.

Many 'smaller' but equally inspiring commitments were made over the past two weeks, including one by 11 countries which created the Beyond Oil and Gas Alliance (BOGA). Ireland, France, Denmark, and Costa Rica among others, as well as some subnational governments, launched this first-of-its kind alliance to set an end date for national oil and gas exploration and extraction.



6.6. Gini Coefficient in Singapore over the years

From the graph below, the upper and lower lines represent income inequality before and after accounting for Government Transfers and Taxes respectively.



Source: www.singstat.gov.sg



St. Andrew's Junior College H1 Economics

Theme: Market Failure (MF) and Government Intervention (GI) Part I

