ST ANDREW'S JUNIOR COLLEGE
JC 1 H2 ECONOMICS 2023
Market Failure and Government Intervention (Part 1)

In the chapter of the Central Problem of Economics, we learnt that scarcity requires rational choices to be made about how resources are to be allocated to the production and consumption of goods and services. 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.

The decision-making process with the government as the main focal point can thus be used as an approach to gain a better appreciation of the complexities of decision-making at the governmental level.

Learning about market failure will deepen our understanding of real-world complexities, equip us with the tools to analyse 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.

Reading List and Reference

1. *John Sloman (2014), *Economics 9th edition*, Ch 10-12, Pages 284 - 378
2. *Mankiw, Quah and Wilson (2008), *Principles of Economics: An Asian edition*, Pages 207 – 248
3. Peter Maunder, Economics Explained Revised 3rd edition, Pages 124 - 125
4. Roger A. Arnold, *Economics 4th edition*, Pages 679 – 682, 691 – 692
5. Stanlake and Grant, *Introductory Economics 6th edition*, Pages 221 – 222

* Highly recommended readings

Learning Objectives

By the end of this series of lectures and tutorials, you should be able to:

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.
- Understand that markets may fail in terms of non-provision of public goods and services by the market, or non-socially optimal level of production and/or consumption due to the presence of externalities, information failure, immobility of factors of production, and market dominance.
- Explain with diagrams, how the presence of externalities leads to a divergence between private costs/benefits and social costs/benefits and causes 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.

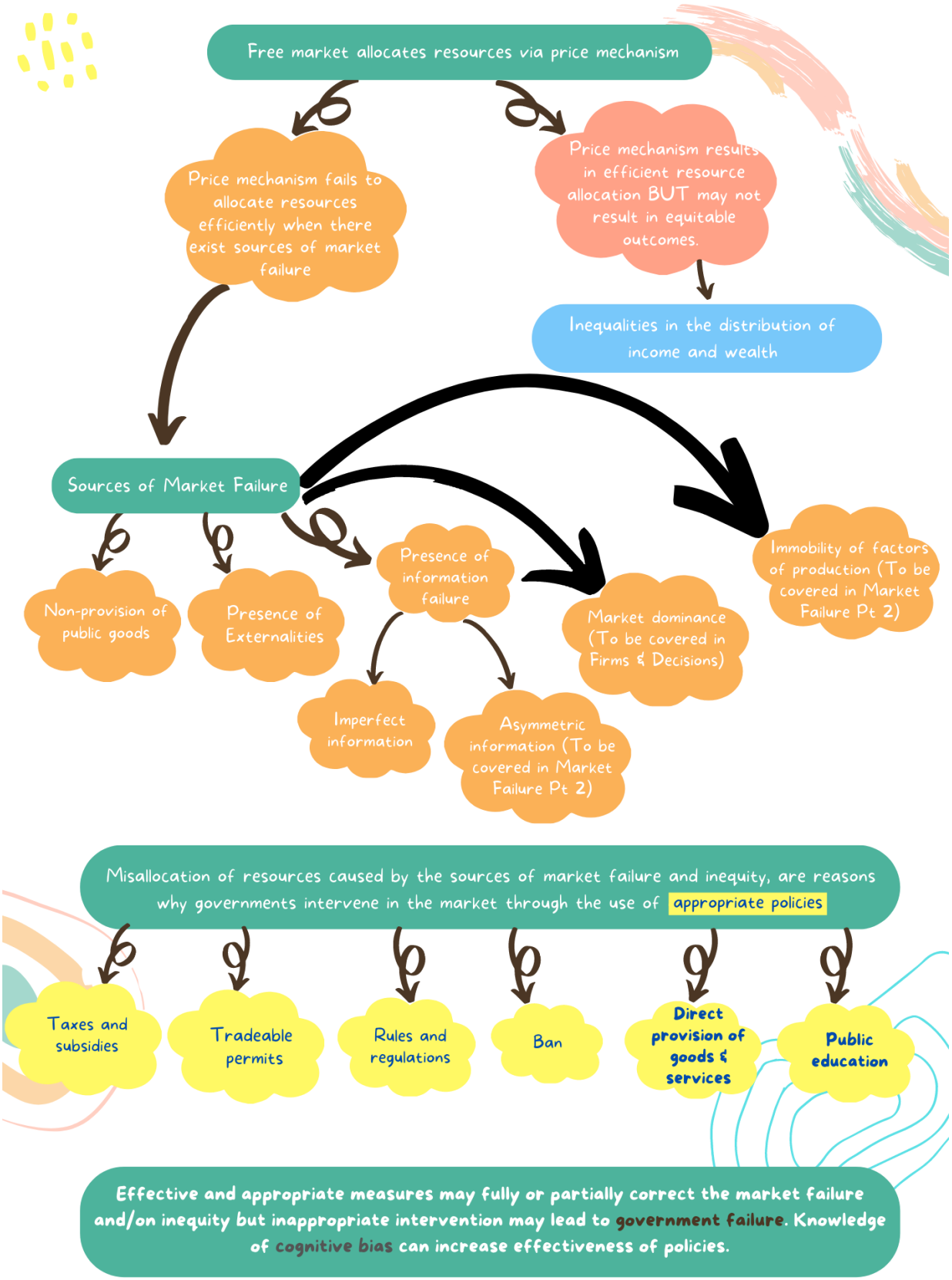
Government intervention in markets

- Understand that governments intervene to achieve microeconomic objectives in relation to efficiency and equity.
- Explain how governments intervene to correct market failures and inequity.
- Examine the effectiveness of policy measures by which governments intervene in markets.
- Explain and evaluate the limitations and trade-offs of different policy measures, which can take the form of economic, social or political considerations.
- Describe with examples how the knowledge of cognitive biases can enable a government to enhance the effectiveness or recognise the potential limitations and trade-offs of its policies.
- Discuss how government intervention may result in outcomes that are more inefficient or inequitable as compared to no intervention because of government failure.

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
- Positive and negative externalities
- Information failure

Concept Map for the Topic of Market Failure and Inequity



1. GOVERNMENT'S MICROECONOMIC OBJECTIVES

1.1. Efficiency and Equity in Markets

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?

"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. Normally, the price mechanism is good at allocating 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.

1.2. Microeconomic Goals of Government

1.2.1. Efficiency

A society is considered to have achieved efficiency when it is allocatively and productively efficient in the use of resources.

- **Productive efficiency**[1]: 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: Productive Efficiency and the PPC

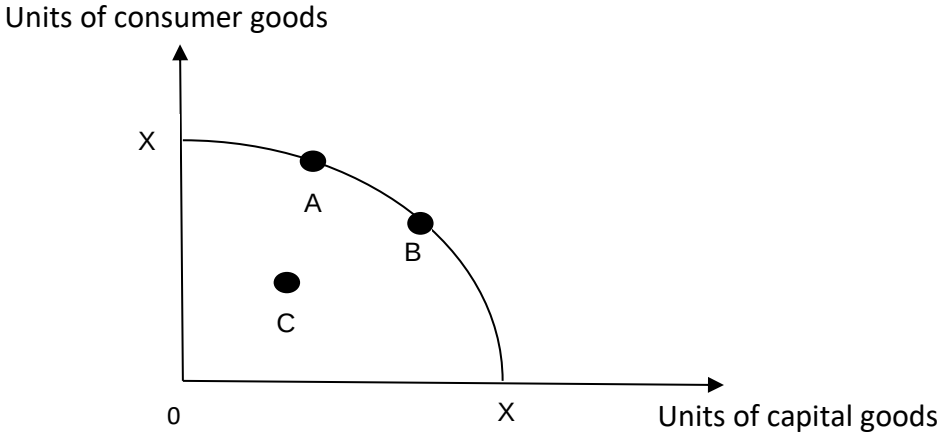


Fig. 1: Productive Efficiency illustrated on a PPC

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.

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

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

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 conditions[2] 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.

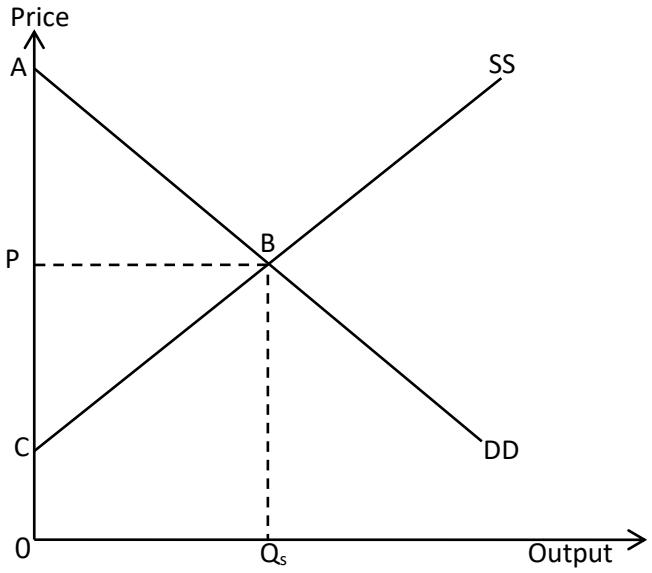


Fig. 2: Market Equilibrium

This 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 $0Q_S$ at price 0P. 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.

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

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.

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.

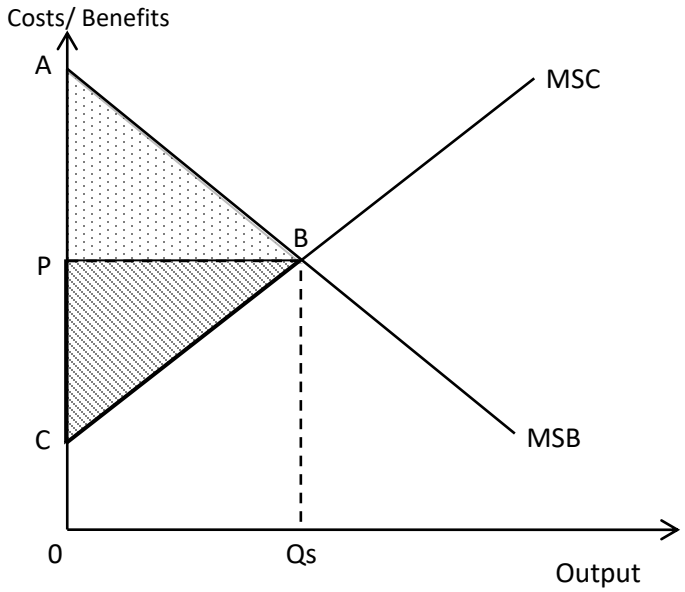


Fig. 3: Efficient Allocation of Resources

In Fig. 3 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 benefit[3] 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.

1.2.2. Equity

Equity is concerned with how resources are distributed throughout society. Equity is often normative. 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.

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.

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

[3] net benefit = benefit – cost

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.

2. MARKET FAILURE AND GOVERNMENT INTERVENTION IN THE MARKET

Definition: 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 maximised.

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 1.2 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 and asymmetric information)
    - Market dominance
    - Immobility of factors of production
- Non-provision of public goods

Externalities, imperfect information and public good will be examined in this set of notes. Market dominance will be covered in Firms & Decisions. Asymmetric information and immobility of factors of production will be covered in Market Failure (Part 2).

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

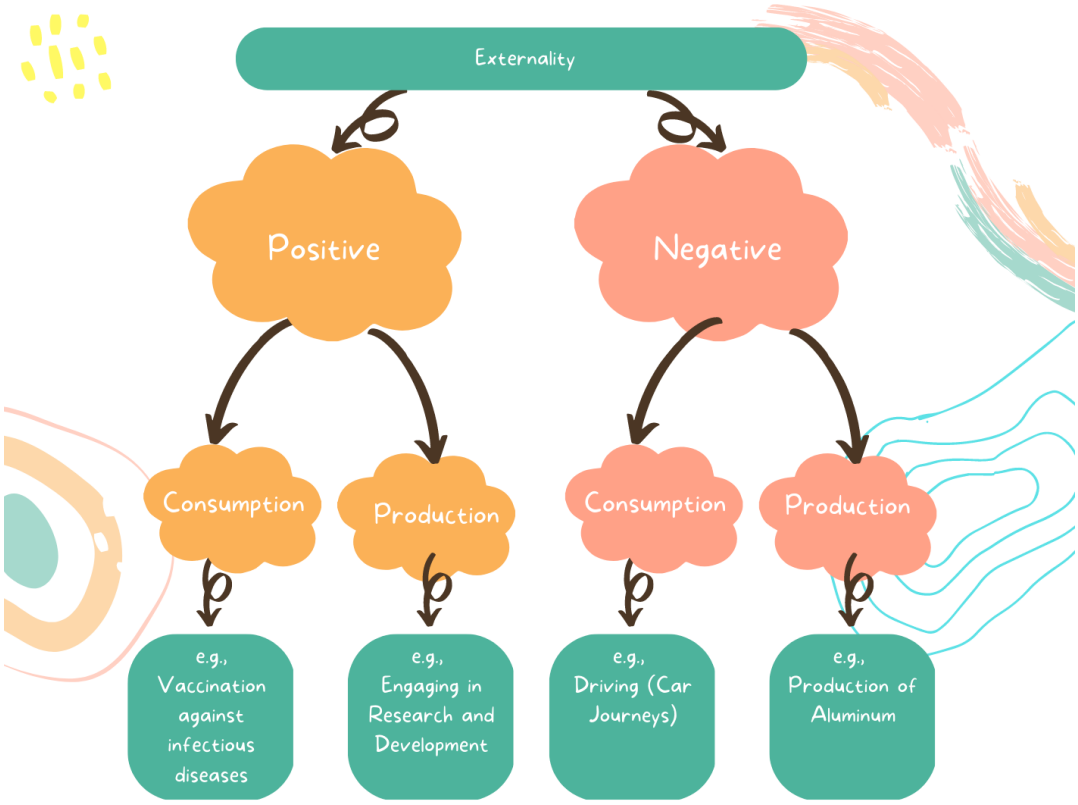
A partial market failure exists the price mechanism allocates some resources to the production of the good but not at the socially efficient output level.

2.1. Presence of Negative 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.

a) **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.

b) **Marginal Private Cost (MPC)** is the *additional cost incurred by individual person/firms* in the production or consumption of an *additional* unit of the good or service.

c) 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 and marginal external benefit*.

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 and marginal external cost*.

MSC = MPC + MEC

Resource Allocation in the absence of externalities

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

In Fig. 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 0Q. At this level of output, resources are efficiently allocated to the production and consumption of the good and society's welfare is maximised.

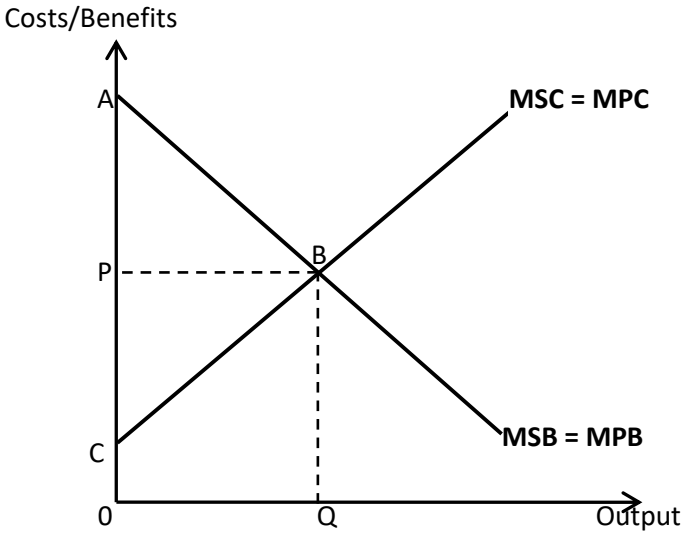


Fig. 4: Socially Optimal Equilibrium

In reality, in the pursuit of self-interest, producers and consumers consider only their private costs and 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 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.

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

Some examples of negative externalities

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

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

2.1.1. Negative Externalities in Consumption

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 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.

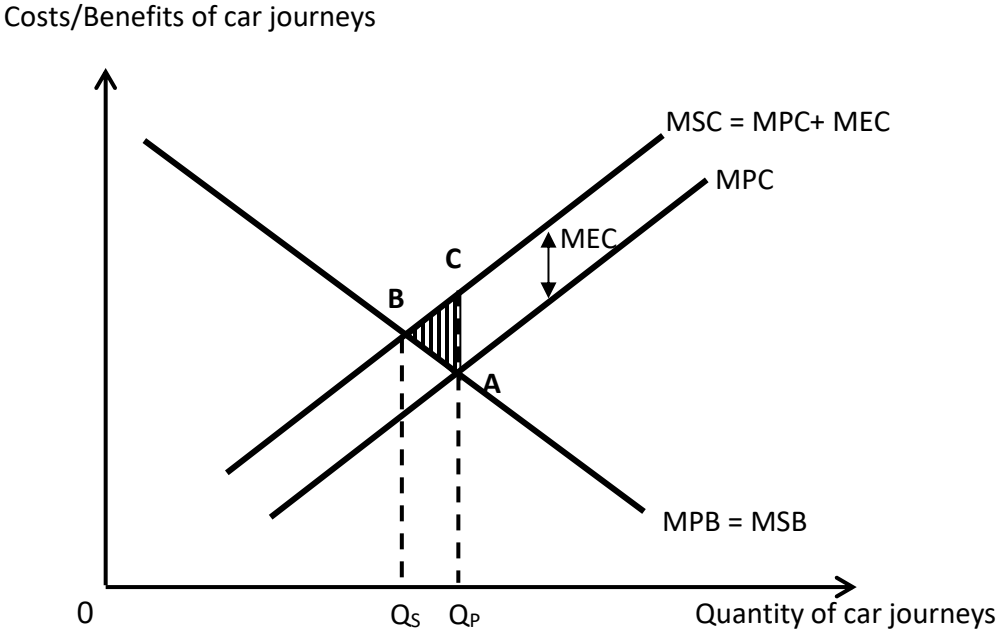


Fig. 5: Negative externalities in consumption[4]

In Fig. 5 above, MPB is the value of the additional benefit that a car 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 car driver such as cost of fuel, time and maintenance costs.

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.

[4]Fig. 5 shows negative externalities in consumption/production. 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.

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).

Therefore, a negative externality in consumption leads to a divergence[5] between MSC and MPC as represented in Fig. 5, where MSC (MPC + MEC) > MPC.

How Negative Externalities in Consumption Lead to Market Failure

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 $0Q_P$ in Fig. 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 $0Q_S$.

The market equilibrium quantity $0Q_P$ is more than the socially optimal quantity $0Q_S$.

At 0Qp number of car journeys, MSC>MSB due to the presence of negative externalities in consumption. 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 Fig. 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 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.

[5] A divergence is used here as 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.

2.1.2. Negative Externalities in Production

An example of a negative externality in production is the air pollution from toxic industrial fumes generated by an aluminium manufacturer. A nearby laundry shop owner who is not involved in the production of aluminium is adversely affected by the production of aluminium as his laundry is soiled by the fumes. Hence, the laundry shop owner is the third party who has to incur additional cost to remove the stains.

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.

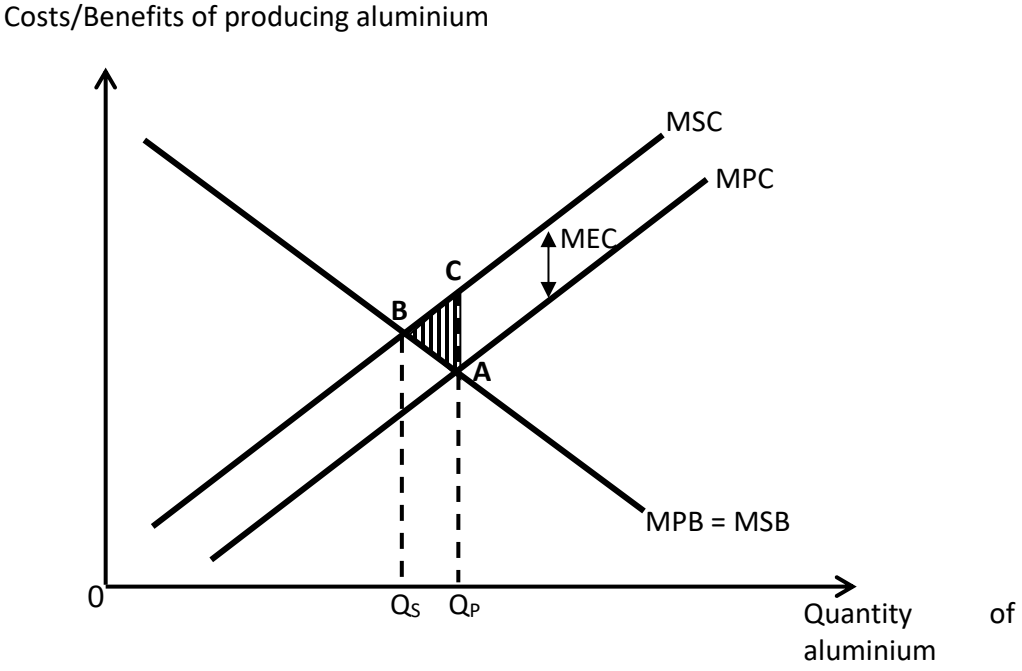


Fig. 6: Negative externalities in production

When negative cost on third parties is generated, MSC>MPC since MSC=MPC+MEC as represented in Fig. 6.

How Negative Externalities in Production Lead to Market Failure

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 $0Q_P$ in Fig. 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. At $0Q_P$, since MSC>MSB, society deems that less aluminium should be produced to maximise the society's welfare.

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.

Hence, there is over-allocation of resources to the production of aluminium.

Fewer resources should be allocated to its production.

Reducing this level of production to $0Q_S$ will lead to an increase in society's welfare.

Note: *The MPC curve and MSC curve have been drawn to be parallel because the assumption made is that MEC is constant at all levels of consumption/production. If the MEC is increasing i.e., higher at higher levels of consumption/production, then MPC curve and MSC curve may not be parallel.*

2.1.3. 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. Fig. 7 shows that there is over-consumption/over-production of the good by Q_SQ_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.

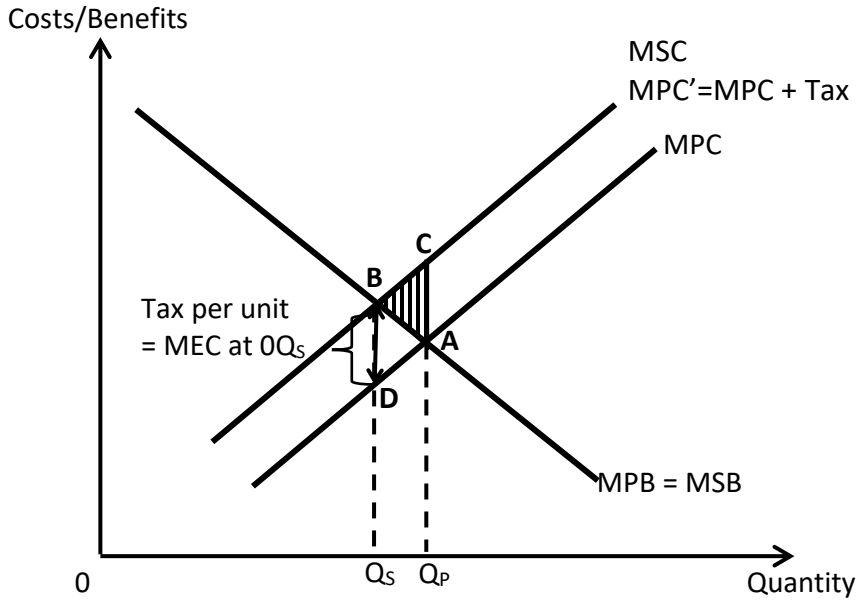


Fig. 7: Socially optimal outcome achieved after imposition of tax

a) Tax Policy

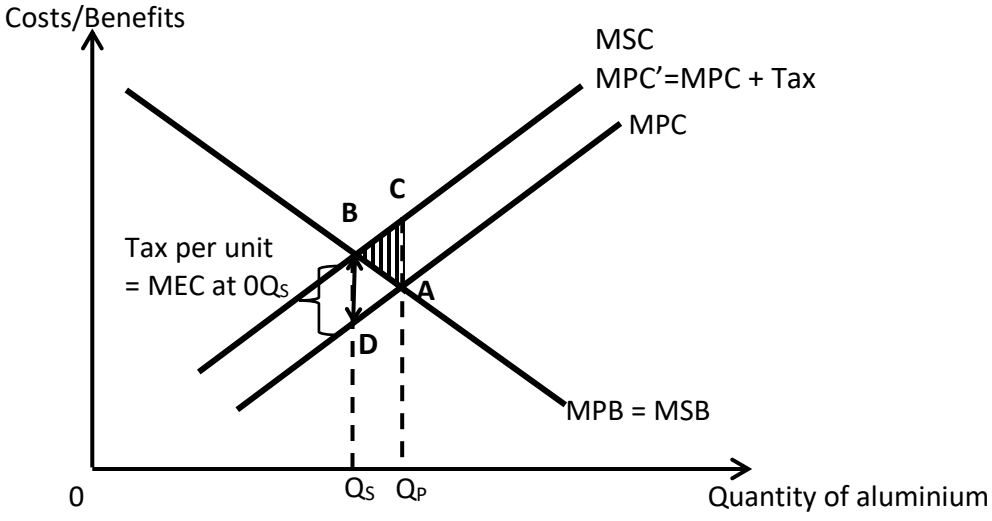


Fig. 8: Socially optimal outcome achieved after imposition of tax (reproduced)

In the case of the over-production of aluminium, consider a tax per unit equal to the MEC at $0Q_S$. This corresponds to BD in Fig 7. When such a tax is imposed by the government, it has the same effect as an increase in the cost of production, MPC is raised to MPC' as the aluminium producer is forced to internalise the external cost that he generates**.**

In other words, with the tax per unit that is equal to MEC at OQs, the producer now bears the external cost. The producer will respond by reducing the output level to $0Q_S$ 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.

Similarly, a tax per unit equal to the MEC at $0Q_S$ 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.

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.

Loss Aversion is a type of cognitive bias.

Cognitive biases exist when someone thinks in a way that can be regarded as irrational or that goes against good judgement, resulting in choices that are sub-optimal.

Loss aversion refers to the tendency for people to prefer avoiding a loss over making an equivalent or greater gain. Loss aversion is a cognitive bias in which the pain of losing something could be as much as twice as powerful as the pleasure of gaining the same thing. This fear of losing results in people trying to avoid losses in whatever way possible, including taking unnecessary risks or engaging in irrational behaviour.

For more information on cognitive bias, refer to Appendix 5.6

Limitations of Tax Policy

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.

The amount of tax imposed in order to achieve the socially efficient level of output is difficult to estimate as it is difficult to estimate the amount of external costs imposed on the society.

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.

The deadweight loss may be reduced but is not eliminated if the tax is not equal to the MEC at $0Q_S$. However, the outcome is still better than that in the free market because production level is closer to the socially optimal level.

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 reduces the effectiveness of road pricing as a measure to control road usage and hence traffic congestion. This is an example of sunk cost fallacy.

The Sunk Cost Fallacy is another type of cognitive bias.

The Sunk Cost Fallacy explains the tendency for people to follow through an endeavour if they have already invested resources (time, effort, or money) into it, whether or not the current costs outweigh the benefits.

For example, after money is invested for a buffet, consumers tend to persist with it because the money invested cannot be recovered. Consumers end up trying to make the most of it even though the behaviour will cost more than its benefits.

For more information on cognitive bias, refer to Appendix 5.6

b) Quota

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 Qs.

In the case of over-production of aluminium, the government can limit production of aluminium to the socially optimal level at Qs.

In the case of over-consumption of car-journey, the Certificate of Entitlement (COE) system has been used to tackle the issue of car ownership 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.

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.

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.

In the case of negative externalities in the form of car congestion it not directly due to car ownership but car usage. Quota targets only car ownership. In fact, with COE deemed as a sunk cost[6], drivers may be more likely to drive more.

c) Total Ban

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.

[6] Sunk costs are past expenditures that are unrecoverable. Refer to Sunk Cost Fallacy on page 23

For example, narcotics such as Ecstasy and Heroin, when consumed, would incur an external cost to the society and hence welfare loss.

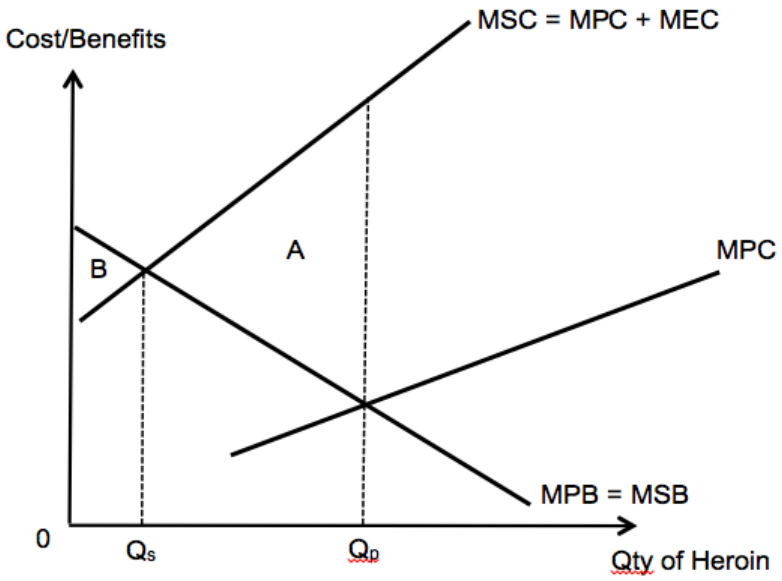


Fig. 9: Comparing welfare loss due to negative externality vs total ban

Fig. 9 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 $0Q_P$ is higher than the socially efficient output $0Q_S$. 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 $0Q_S$ of heroin is consumed. Thus, compared to the socially optimal output of $0Q_S$, zero consumption, due to ban, will lead to net total welfare loss of 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

In the case of a ban, enforcement costs may be high and it might be difficult to ensure compliance.

There will still be welfare loss incurred by the society. However, the welfare loss is smaller than if the ban had not been imposed.

Also, if the 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 ban always the best solution?

A ban will be the best solution if:

- 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

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.

Once the quota is allocated, the market forces take over. Those polluters that can reduce their emissions relatively cheaply may find it profitable to do so as they can sell their 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 OQs), producers would have to internalise the external cost and this would shift the MPC curve to MPC' which happens to coincide with MSC. 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 OQs amount of aluminium. The use of

tradable permit results in the internalisation of the external cost and eliminates the deadweight loss of area ABC.

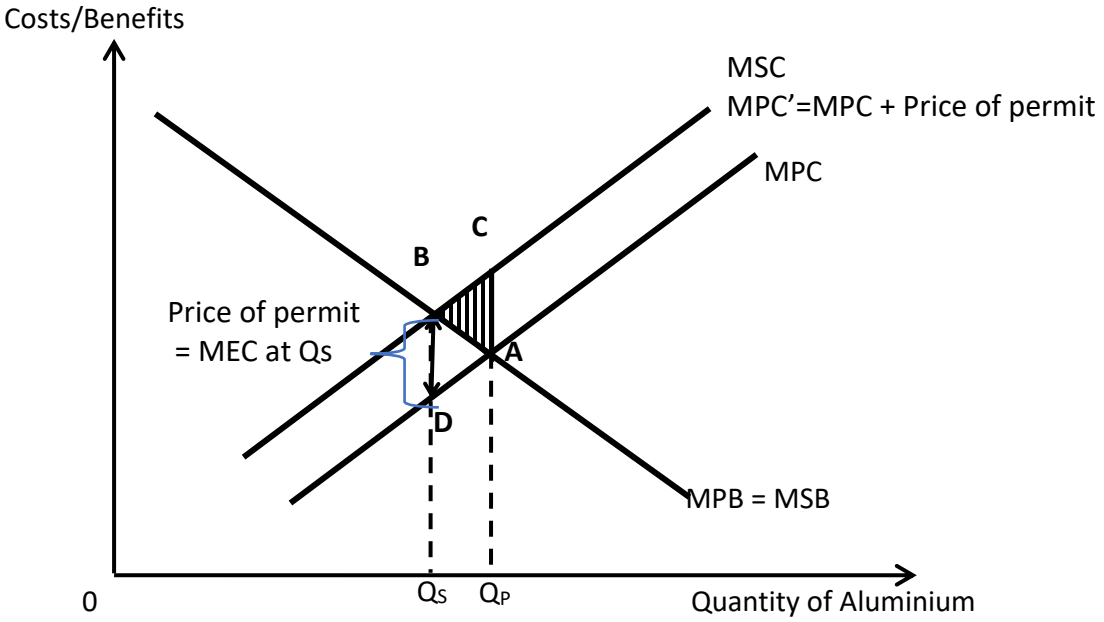


Fig. 10: Socially optimal outcome achieved after imposition of tradable permit

Advantages of Tradable Permits

This measure encourages and motivates producers to lower pollution levels to cut costs and also possibly to reap revenue from selling their unused permits. The socially optimal level of production that produces the 'ideal' amount of pollution is pre-determined by the government and this would ensure the level of pollution in the region/country remains manageable.

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.

The problem is compounded because 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.

There will be 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 Appendix 5.4 and Appendix 5.5 to learn more about actions taken to reduce the effects of negative externalities on the environment.

2.2. Presence of Positive Externalities and Government Intervention

2.2.1. Positive Externalities in Consumption

An example of a positive externality in consumption is the external benefit that is generated 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 thus not only confined to the individuals who are vaccinated. People who do not go for the vaccination will also benefit as the probability of contracting diseases, such as measles, is now reduced. 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).

$$MSB = MPB + MEB$$

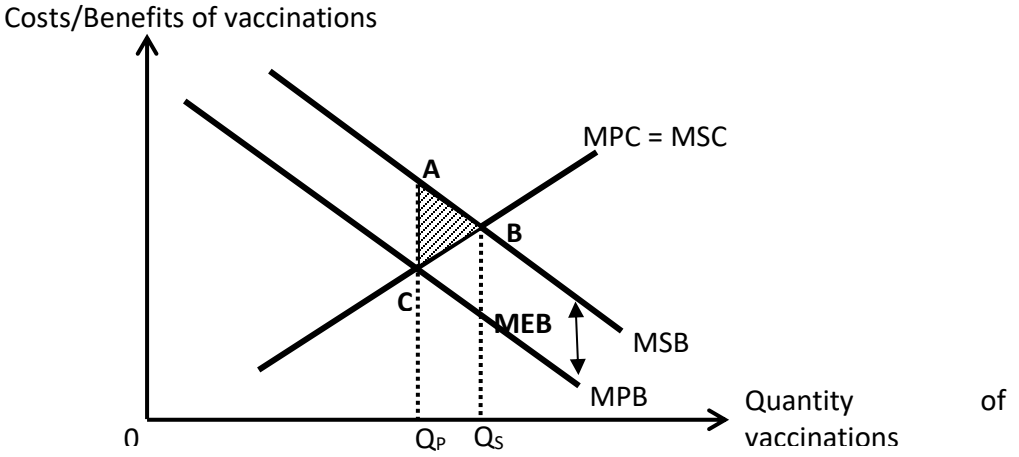


Fig. 11: Positive Externalities in consumption[7]

Thus, due to the positive externality in consumption, it leads to a divergence[8] between MSB and MPB i.e., MSB > MPB as shown in Fig. 11 above.

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.

How Positive Externalities in Consumption Lead to Market Failure

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 Fig. 8. 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.

[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] 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.

However, at $0Q_P$, MSB exceeds MSC due to the presence of positive externality in the consumption of vaccines. This means that the consumption of an additional unit of vaccine enables the society to enjoy more benefits than the cost incurred in consuming it. Thus, more units of the vaccine should be consumed to attain the socially optimal level of consumption where MSB=MSC[9]. This occurs at the socially optimal level of $0Q_S$.

Therefore, from society's point of view, left to the free market where consumption is $0Q_P$, the vaccine is under-consumed.

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 amount 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.
the area representing the social costs of using resources to produce Q_PQ_S is equal to area Q_PCBQ_S.

Since social benefits > social costs 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 what the private consumer values it. Hence, there is an under-allocation of resources to the consumption of this good. More resources should be allocated to achieve allocative efficiency.

2.2.2. Positive Externalities in Production

An example of a positive externality in production is engagement in research and development (R&D) by a pharmaceutical firm in developing drugs for cancer. This increases the information flow regarding the disease in the medical arena as it may reveal some causes of cancer. Hence, there is a positive externality in production as there is an external benefit accorded to those not directly involved in the R&D activity.

The pharmaceutical firm, which aims to maximise its profits, 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) as MPB reflects the additional benefits directly accruing to the firm and MPC reflects the additional cost directly incurred by the firm embarking on an additional unit of research and development.

[9] 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.

Similar to the case of positive externality in consumption, a positive externality in production also leads to a divergence between MSB and MPB as represented in Fig. 9, where MSB > MPB at all output levels.

How Positive Externalities in Production Lead to Market Failure

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

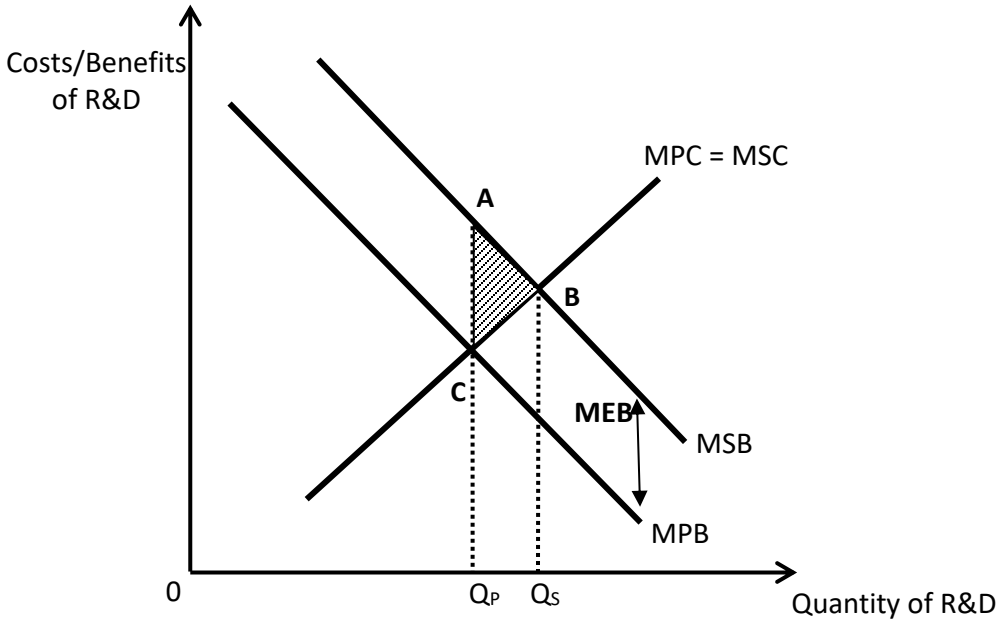


Fig. 12: Positive Externalities in production

Left to the free market, the development of new drugs will be at $0Q_P$ in Fig. 12. This is because the pharmaceutical firm motivated by self-interest will produce up to the point where Marginal Private Benefit (MPB) = Marginal Private Cost (MPC). Hence, $0Q_P$ represents the market equilibrium level of production.

However, at $0Q_P$, MSB exceeds MSC due to the presence of positive externality in production.

This means that the production of an additional unit of research and development enables the society to enjoy more benefits than the costs incurred in producing it because of the increased & improved information about cancer.

Thus, from society's viewpoint, more units of research and development activities should be produced to attain the socially optimal level of production.

This social optimum is achieved where MSB = MSC and the amount of R&D is $0Q_S$.

Therefore, from society's point of view, at $0Q_P$, the cancer-related R&D is under-produced.

In this case, the price mechanism fails to bring about a socially efficient allocation of resources in the research and development of cancer-related drugs. The reason is that the external benefits of R&D are not priced by the price mechanism and therefore not included in the private benefits, 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.
the area representing the social costs of using resources 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 $0Q_S$ because for all units from Q_P to Q_S society values the extra unit of the good more than what it costs the society to produce it. Hence, there is an under-allocation of resources to the production of this good. More resources should be allocated to achieve allocative efficiency.

Note: *The MPB curve and MSB curve have been drawn to be parallel because the assumption made is that MEB is constant at all levels of consumption/production. If the MEB is decreasing i.e., lower at higher levels of consumption/production, then MPB curve and MSB curve may not be parallel.*

2.2.3. 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.

Positive Externality in Production

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

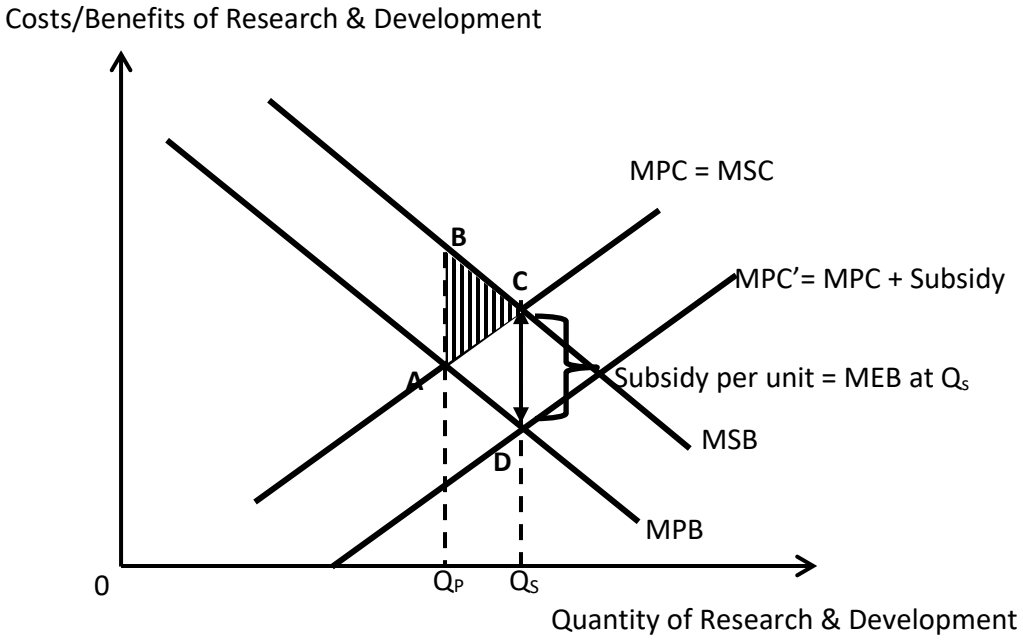


Fig. 13: Case of positive externalities in production (subsidies given to producers)

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 at $0Q_S$ which is the social optimal output where MSB = MSC.

This will shift the MPC curve by CD to the MPC' curve, where MPC'= MPC + Subsidy. With the subsidy, the producers' cost of production would fall from MPC to MPC'. Producers now produce OQ_S amount of output where MPB = MPC'. This production level coincides with the socially optimal level of output, i.e., $0Q_S$.

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

Positive Externality in Consumption

Subsidies on Consumption

An example is vaccination against chicken pox by direct reimbursement. An analysis of this is illustrated in Fig. 14 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.

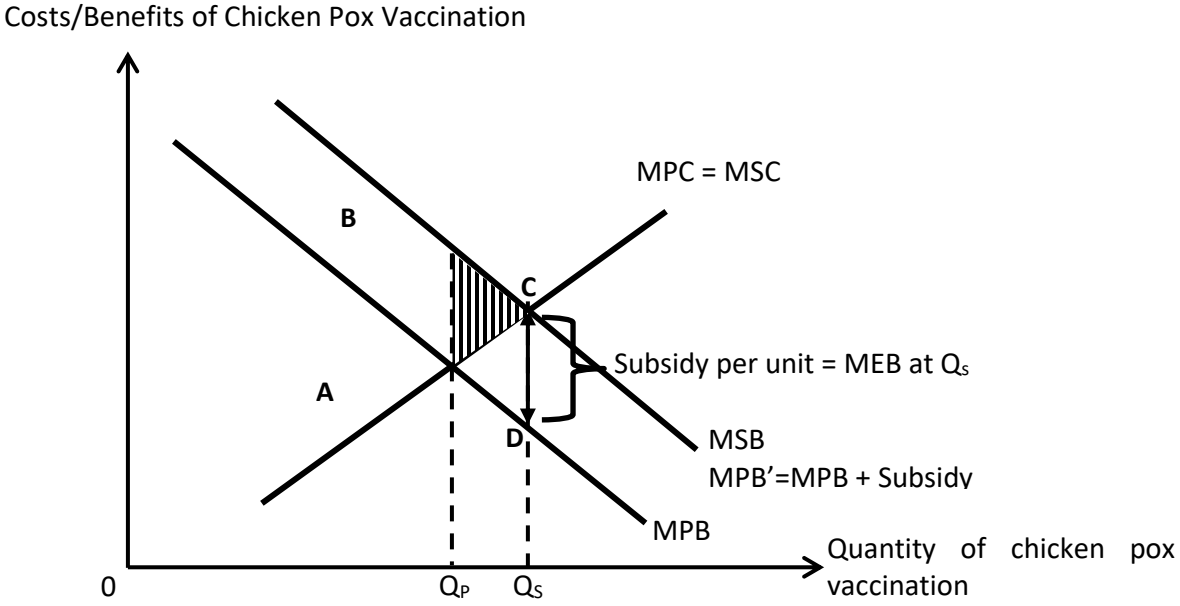


Fig. 14: Case of positive externalities in consumption (subsidies given to consumers)

To correct the under-allocation of resources and therefore under-consumption of chicken pox vaccination, the government provides a per unit subsidy that is equal to the marginal external benefits at $0Q_S$ which is the social optimal output.

This is represented by the vertical distance (CD) between the MPB and the MSB curves at $0Q_S$. 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 at a consumption level that is deemed to be socially optimal, OQ_S, where (MPB' = MPC).

In doing so, consumers will consume at the same consumption level where MSB = MSC. The deadweight loss 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 inoculation 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 leads 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.

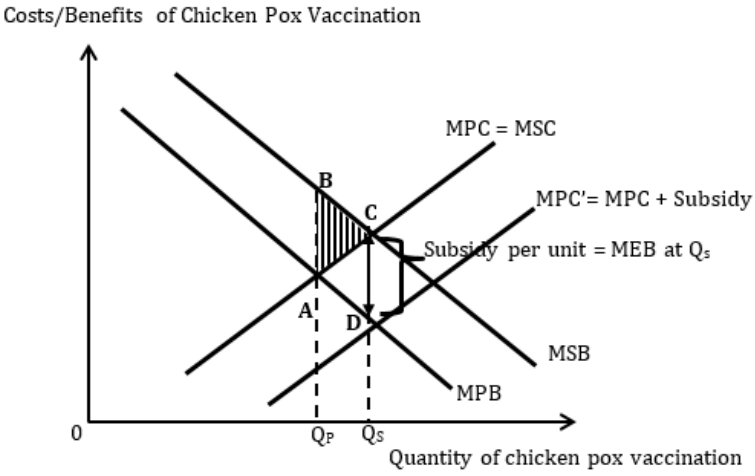


Figure : Case of positive externalities in consumption (subsidies given to producers)

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 at $0Q_S$ which is the socially optimal output.

This is represented by the vertical distance (CD) between the MPB and the MSB curves at $0Q_S$. 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 $0Q_S$, the deadweight loss is eliminated.

THINK ABOUT IT

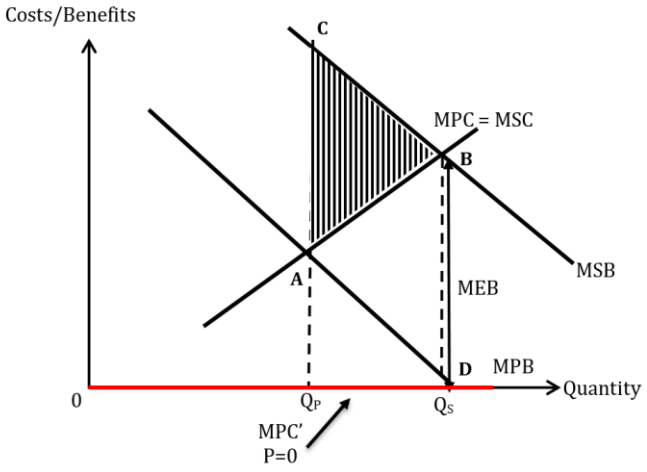
Qn: Would providing free access to a good or service be the best way to achieve efficient allocation of resources?

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 OQp as shown in diagram below. However, the socially optimal level of consumption should be at OQs where MSB = MSC. This results in the DWL area of ABC.

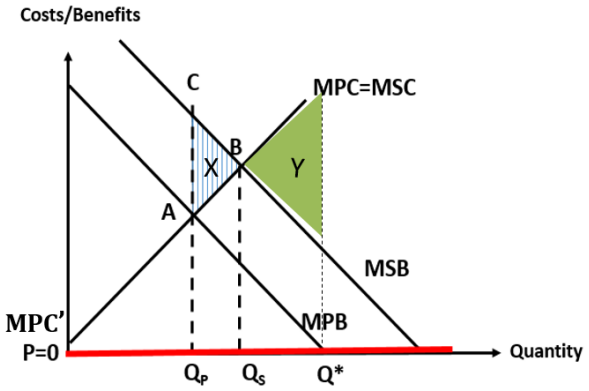
When the Singapore government decides to provide free entry to the museums, this would lead to the marginal private cost of consumers (MPC) to shift to MPC' which is where price is equal to zero (P=0).

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 OQs, which coincides with the socially optimal level of consumption thus addressing under-consumption.



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

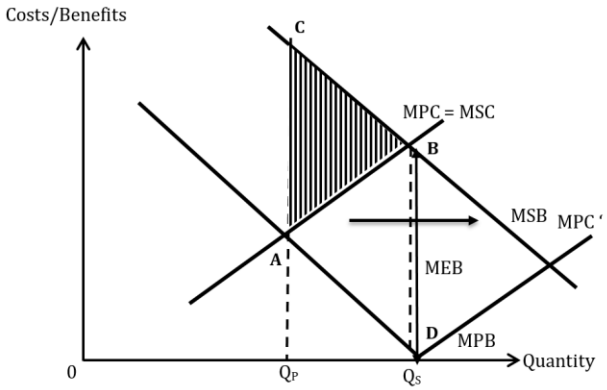
[Continued]
When goods or services are provided for free, consumers tend to overconsume the goods or services and thus could result in the scenario of over-consumption as shown below.



Due to the subsidy such that MPC decreases to MPC' where MPC = 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 OQs. 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 OQs (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 OQs, which coincides with the socially optimal level of consumption thus addressing under-consumption.

Advantages of Subsidies

A per unit subsidy that is equal to the marginal external benefits at $0Q_S$ raises consumption level from $0Q_P$ to $0Q_S$ – the socially optimal level, and deadweight loss is completely eliminated. Subsidy can also improve equity and reduce social exclusion as low-income households who cannot afford the goods can now 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.

- 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

Government provision can increase consumption of a good to be at/closer to the socially optimal level if positive externalities exist.

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

Advantages of Government Provision

Consumption level will be increased to be at/closer to the socially optimal level, $0Q_S$, 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 again take a toll on the government budget and divert 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 public 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 Appendix 5.1 for a more detailed analysis of the healthcare market in Singapore.]

c) Legislation

The government can formulate rules and legislation to bring the consumption of goods with positive externalities up to the socially optimal level.

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.

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.

Limitations of Legislation

This measure entails high administration costs to ensure compliance by consumers. More manpower needs to be employed to conduct checks on consumers. 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 requires 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.

2.3. Presence of Information Failure and Government Intervention

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

2.3.1. 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.

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. The perceived marginal private benefits from consuming these products might be over-estimated by consumers. 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 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 that 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 true 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 consider the opportunity cost of this decision such as the benefit derived from time he could have better spent elsewhere.

2.3.2. Information Failure – Underestimation of costs

Consumers may under-estimate the long-term damage to their health from cigarette smoking due to ***information failure.***

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

Hence the perceived MPC is lower than the true MPC as shown Fig. 15(a).

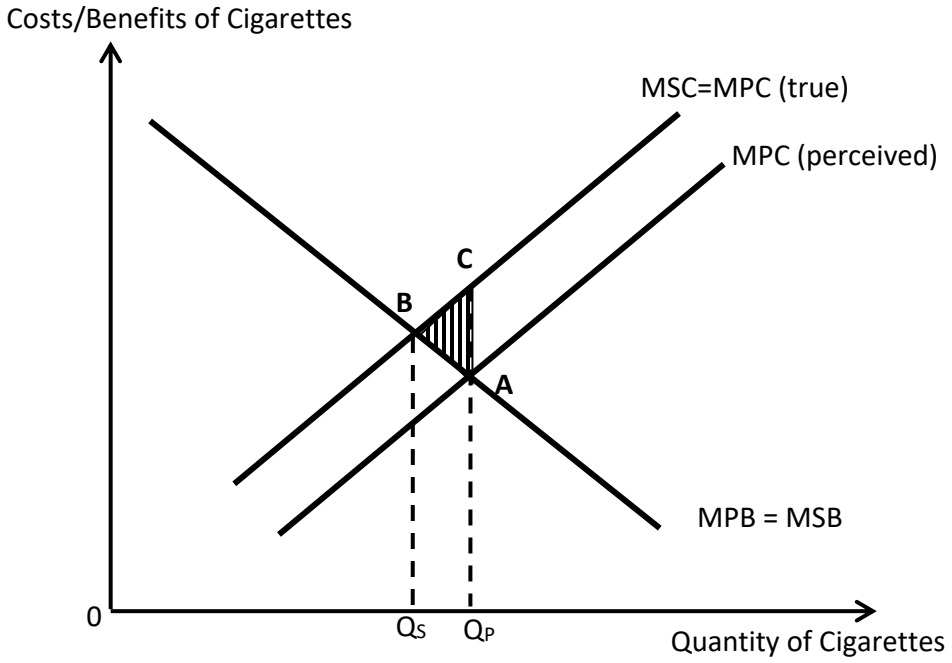


Fig. 15(a): Over-consumption of Cigarettes

The socially optimal quantity is $0Q_S$ where MSB=MSC. If there is no government intervention in the consumption of cigarettes, consumers will consume at $0Q_P$ (where MPB= perceived MPC) rather than at $0Q_S$ which is the allocatively efficient quantity.

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 $0Q_S$ results in a deadweight loss of area ABC for the society.

When dealing with the information failure in this market, government often implement educational campaigns to educate the public on the consequences of smoking.

It also uses legislation to mandate cigarettes producers to print warnings on cigarette boxes to persuade buyers from smoking.

These measures will have the effect of shifting the $MPC_{perceived}$ up to MPC_{true}=MSC. The consumers, after being aware of the harmful effects of smoking to themselves, will consume at a quantity where MPC_{true}=MPB=MSC=MSB.

As a result, the market equilibrium output will now be the socially optimal output 0Qs.

Thus, education campaigns and printing of warning labelling on cigarette packs could discourage smoking and hence eliminate deadweight loss.

The role of the government is often to discourage the overconsumption of cigarettes through various measures such as the imposition of indirect taxes, regulating or prohibiting the production and sale of such goods.

In more extreme cases, it could totally ban the consumption & production of cigarettes.

Information failure –Underestimation of benefits. Consider the market for education. Consumers may under-estimate the marginal private benefit (MPB) generated by the consumption of education due to ignorance about its potential benefits (higher potential income as well as better job prospects, etc).

Hence the perceived MPB is lower than the true MPB as shown in Fig. 15(b).

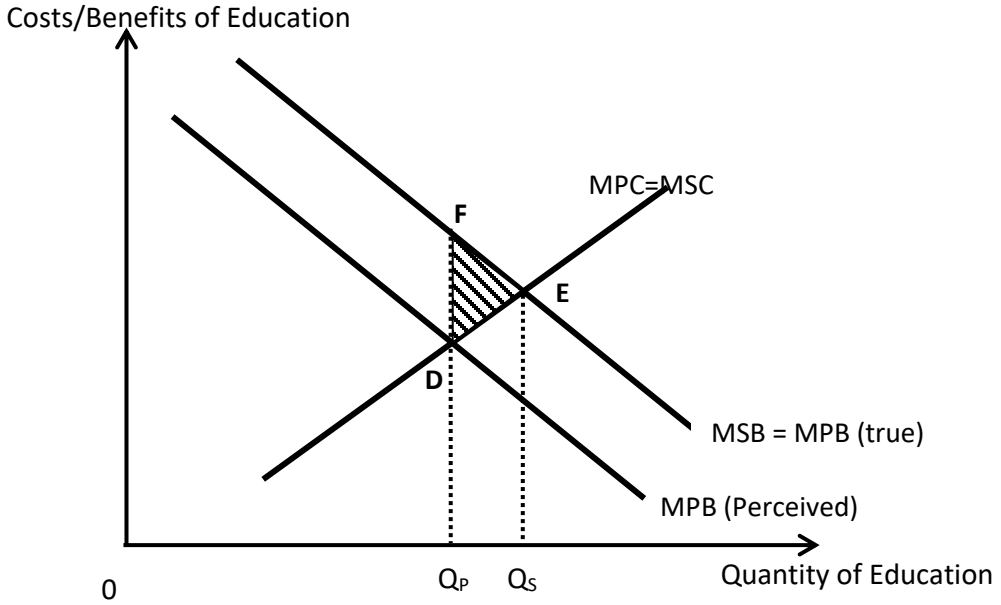


Fig. 15(b): Under-consumption of Education

The socially optimal quantity is $0Q_S$ where MSB = MSC.

If there is no government intervention in the consumption of education, consumers will consume at $0Q_P$ (where perceived MPB=MPC) rather than at $0Q_S$ which is the allocatively efficient quantity.

The quantity under-consumed, Q_PQ_S, would have generated a social benefit of Q_PFEQ_S which exceeds its social cost of Q_PDEQ_S.

Thus, consuming $0Q_P$ instead of $0Q_S$ results in a deadweight loss of area DEF for the society.

Thus, there is a need for government intervention to encourage the consumption of education by correcting the information failure.

One way is to raise the awareness of the benefits of consuming education through campaigns or public education.

Such campaigns and public education could enable individuals to realise the benefits that they could receive from consuming education.

This will have the effect of shifting $MPB_{perceived}$ to MPB_{true}, As a result, the new market equilibrium after the government intervention would be 0Qs where MPB_{true}=MPC=MSC=MSB.

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

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

1. Underestimation of costs
2. Underestimation of benefits
3. Overestimation of costs
4. Overestimation of benefits

Check your answers here:

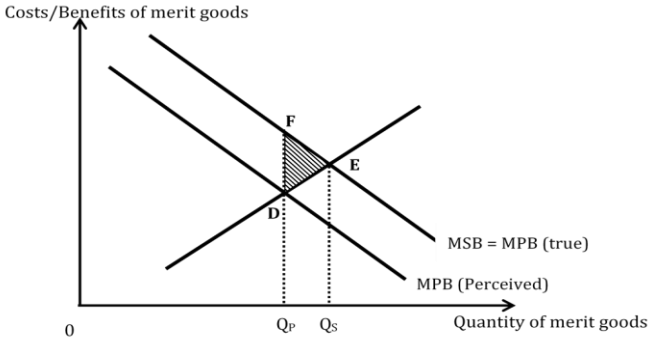
It is not uncommon for markets to have two or more sources of market failures. When answering questions, it is paramount to identify the various sources of market failure in a market and explain those required by the question. Please refer to the example on the next page on how you can illustrate the effects of positive externalities and information failure on the market for education.

THINK ABOUT IT

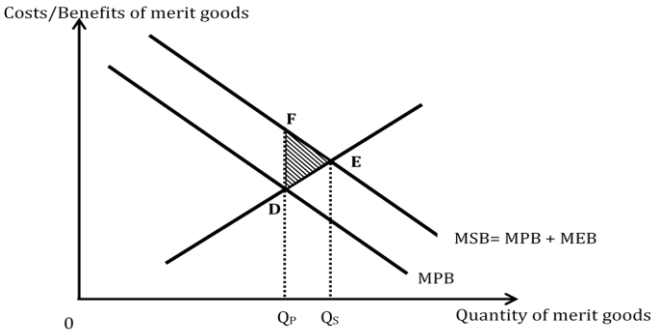
Qn: With the use of a diagram, how would you illustrate the case of market failure for a good which generates positive externalities in consumption as well as information failure?

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 QP where MPB (Perceived) is equal to MPC as consumers seek to maximise their utility. Socially optimal level of consumption is however at Qs where MSB is equal to MSC. As such, there is under-consumption of QpQs 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. active volunteerism, citizenry, and creation of employment for 3rd parties by the educated as they drive innovations and set up social as well as commercial enterprises.



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

Note: It is also possible for this to be done in one diagram. For this approach, you may refer to Appendix 5.8 on Page 87.

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?

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.

2.3.3. Government Intervention to Deal with Imperfect Information

a) Public Education

In view that non-socially optimal levels of consumption and production of goods could be due to imperfect information, 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.

Advantages of Public Education

The problem of non-socially optimal levels of consumption and production of goods by the society may be eliminated and society will consume or produce closer to / at the socially optimal level.

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.

If the 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.

Salience bias is also a type of cognitive bias.

Saliency bias refers to the tendency for people to focus on information that is more prominent and over other less prominent but equally relevant pieces of information. This could lead to people ignoring vital information and making impulsive or uninformed choices. For example, we have a hard time making more environmentally friendly choices because of salience bias. As the environmental costs of not reducing, reusing or recycling are not salient and can only be seen in the long term, we tend to ignore these consequences when making decisions.

Another example of how salience bias can be used to influence behaviour is the issuance of a device mounted on the shower head to provide information on the amount of water usage in the shower. By using animation to show real-time information on the amount of water used, the device provides a conspicuous or salient signal to users who are using too much water, thus nudging them to reduce water usage.

For more information on cognitive biases, refer to Appendix 5.6.

Limitations of Public Education

This 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.

For example, it is rather difficult to persuade the general public to go for routine health check-ups simply because most people do not see the need as they are relatively healthy.

Similarly, for smokers, they 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.

b) Rules and Regulations

The government can make it mandatory for firms to publish relevant information so that consumers can access them readily.

The Singapore government required all hospitals to publish their hospital charges for different kinds of treatments. This increase in transparency of information allows patients to make and more informed choices on where to get their treatment.

It is also necessary 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 by consumers.

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.

Manpower is needed to be employed to conduct checks on consumers. 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.

2.4. 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.

2.4.1. Non-Provision of Public Goods

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?

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 social optimal level occurs where P=MC. This means that P must be equal to 0. However, since the profit maximising firm will not charge P=O, the social optimal level of output will not be achieved.

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 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.

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 analysing public goods.

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

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

Direct Provision

Because of the two characteristics of public goods 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.

3. INEQUALITIES IN THE DISTRIBUTION OF INCOME AND WEALTH

Recall that the government has two microeconomic objectives namely, efficiency and equity. **A market may be allocatively efficient via 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.

Note:

- 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.

3.1. Causes of Income Inequality

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 include differences in qualifications and education level of workers.

For example, there is a greater demand for workers with good qualifications but the supply is lower compared to workers without qualifications.

Therefore, the wages of workers without qualifications tend to be lower than those with qualifications or in possession of certain skills.

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.

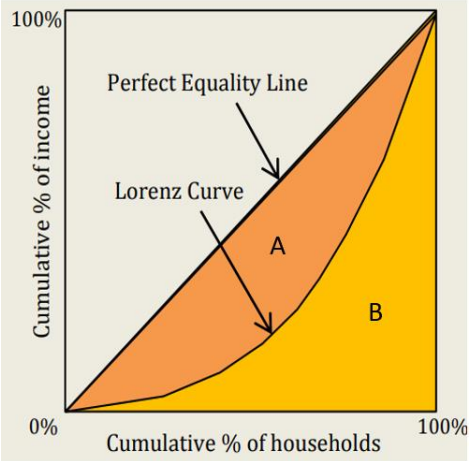


Fig. 16: Lorenz Curve (Source: www.singstat.gov.sg)

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 0.478 in 2012 to 0.459 in 2017. Hence, between 2012 and 2017, the income inequality was lowered.

[Refer to Appendix 5.7 to see how the Gini Coefficient in Singapore changed over the years.]

3.2. Government Intervention to Deal with Inequalities in Distribution of Income and Wealth

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). When higher progressive tax deter foreign investors from investing in a country, and drive away better skilled foreign talents, the economic growth of a country can be adversely affected.

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

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. 17 below, the equilibrium wage of labour ($0W_e$) 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 $0W_f$ is set above the equilibrium wage $0W_e$ 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.

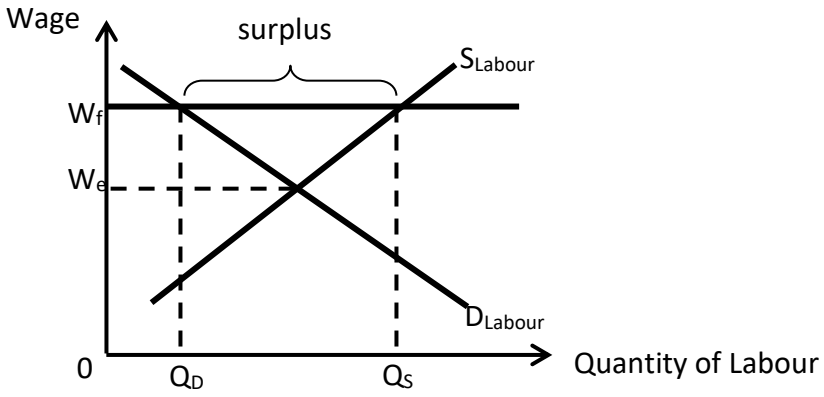


Fig. 17: Effect of a Minimum Wage

Limitations of Legislation

When a minimum wage is set, it results in a surplus of labour or unemployment of Q_DQ_S in the labour market. This is because employers may be less willing to hire labour at the minimum wage of $0W_f$ 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.

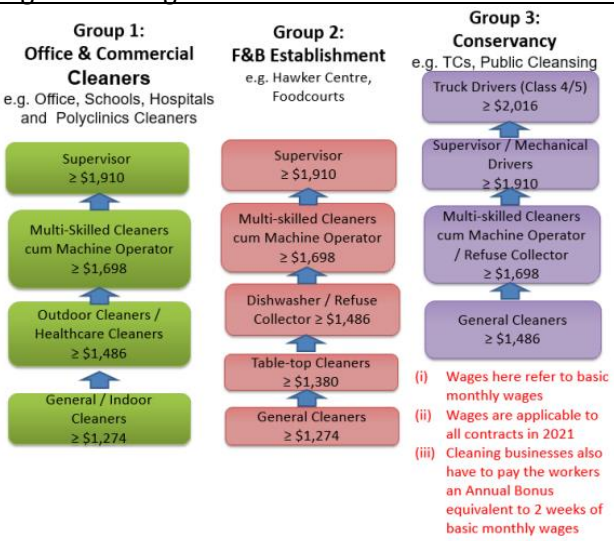
Singapore: The Progressive Wage Model

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 below.

Progressive Wage Model Schedule for Cleaners for 2021



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 three sectors: cleaning, security, 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

In Singapore's Budget 2015, the government introduced the SkillsFuture Credit scheme. This scheme will give 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.

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.

Disadvantages for the above policies (a) to (d)

High taxes on the rich may encourage tax evasion e.g., the self-employed might not declare all their income. It might also lead to a disincentive to work harder as additional income earned is taxed at a higher rate.

In addition, the government has to decide on whom to give and how much to give in terms of subsidies. Again, this will put a strain on the government budget.

4. GOVERNMENT FAILURE

By now, we know that markets can fail and thus there is a need for government intervention. However, sometimes, the government can make the situation worse and may create greater inefficiencies when they intervene in markets. Government failure occurs when the cost of an intervention exceeds the benefits of intervention and, as a result, worsens resource allocation.

4.1. Reasons for Government Failure

a) Lack of/Poor information

To intervene effectively, the government must possess adequate and accurate information. 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 more 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 but may 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.

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 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.
- Explain with diagrams how information failure can cause a divergence between actual and perceived benefits/costs thus, resulting 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.
- Describe with examples how the knowledge of cognitive biases can enable a government to enhance the effectiveness or recognise the potential limitations and trade-offs of its policies.
- Discuss how government intervention may result in outcomes to be even more inefficient or inequitable as compared to no intervention because of government failure.

NOTES:

5. APPENDIX

5.1. Introduction to Behavioural Economics

What are cognitive biases?

Up till now, most of what you have learnt in Economics makes a basic assumption about economic agents (e.g., consumers, firms and governments): that they are rational, self-interested agents who aim to maximise their net benefits.

However, in real life, people do not always act this way. In fact, we often make choices that are sub-optimal, which means these choices do not lead to outcomes that maximise our utility. For example, we may willingly overpay for certain products or procrastinate to the point of missing deadlines. In other cases, our emotions may influence our decisions so much that we end up overvaluing something just because we already own it, and so react more strongly to fines than rewards.

Despite our inherent desire to maximise our utility, we sometimes make decisions that might reduce it. Such seemingly irrational behaviour is due to cognitive biases. Cognitive biases are neither random nor senseless. Instead, they are systematic and predictable. We make the same mistakes over and over because of the basic wiring of our brains. Knowing this, firms may try to maximise profits by tapping on our "irrationality" to get us to overspend or buy things that we did not plan on buying. Governments may also use their understanding of cognitive biases to design policies that help people make better and more informed decisions.

This is what behavioural economics is all about. It studies how people or institutions make decisions and how these decisions are affected by the wiring of our brains, our emotions and other social and cultural factors in our environment. Behavioural economics does not replace conventional economics but complements it to help us better understand human behaviour. It sheds light on situations where people tend to make sub-optimal choices and how we can overcome our instincts to make better and more informed decisions.

In this topic of market failure, you have read some examples how governments can make use of knowledge of cognitive biases to design and evaluate policies to increase its effectiveness. Firms also make use of cognitive bias to formulate strategies to meet its objectives. This will be covered in the topic of Market Structure.

5.2. 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 2.2.2 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, Medifund and Eldershield

- 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 6.5-8.5% (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. Between 2005 and 2011, nearly $1 billion was distributed to elderly Singaporeans this way.
- MediShield is a low cost catastrophic illness insurance scheme. Introduced in 1990, the government designed MediShield to help members meet medical expenses from major or prolonged illnesses, which could not be sufficiently covered by their Medisave balance.
- 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 5% 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. The good thing is that inflation rate in Singapore has been low in the past few years (2017: 21.5%) and hence, there is still an increase in the real value of Medisave money.
- Unfortunately, since Medisave takes up a proportion of income (4%-9%), 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.

5.3. 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 no 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 my 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.

5.4. 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.

5.5. 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.

5.6. 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.

I. 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.

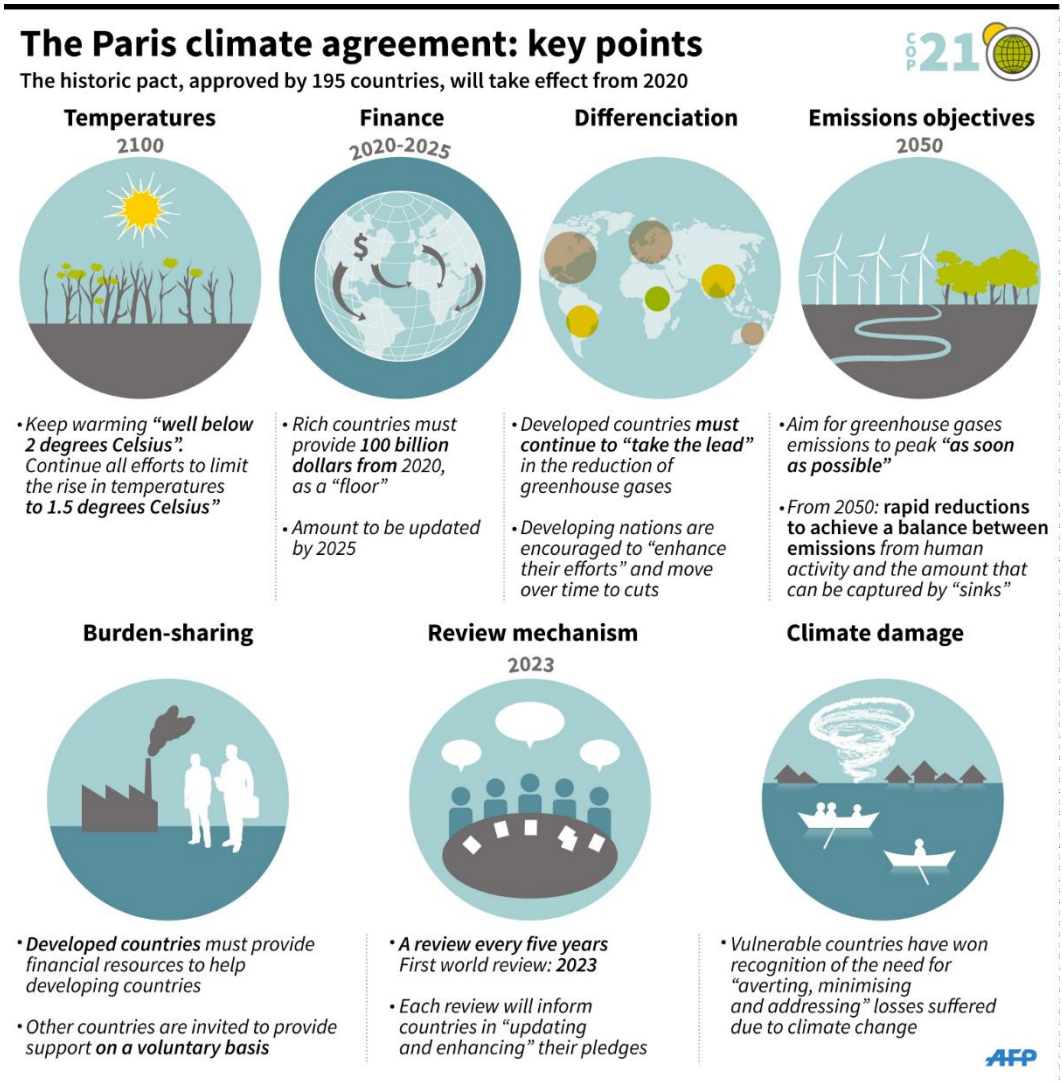
Doha Amendment

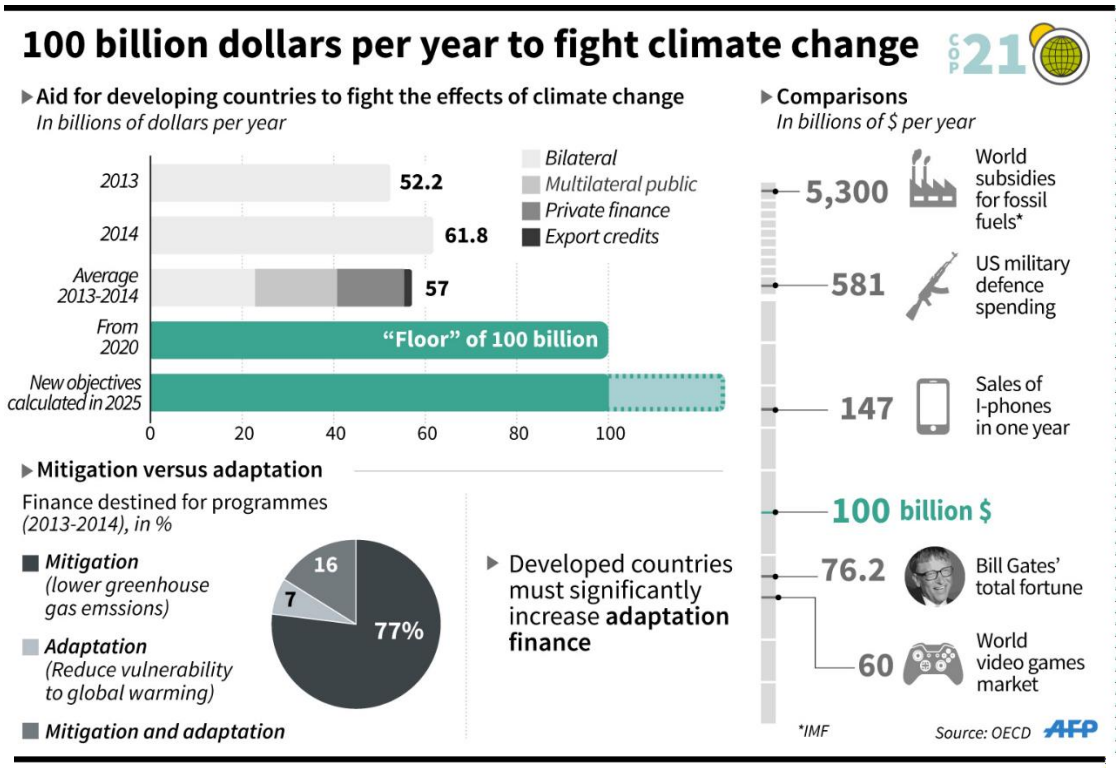
In Doha, Qatar, on 8 December 2012, the "Doha Amendment to the Kyoto Protocol" was adopted.

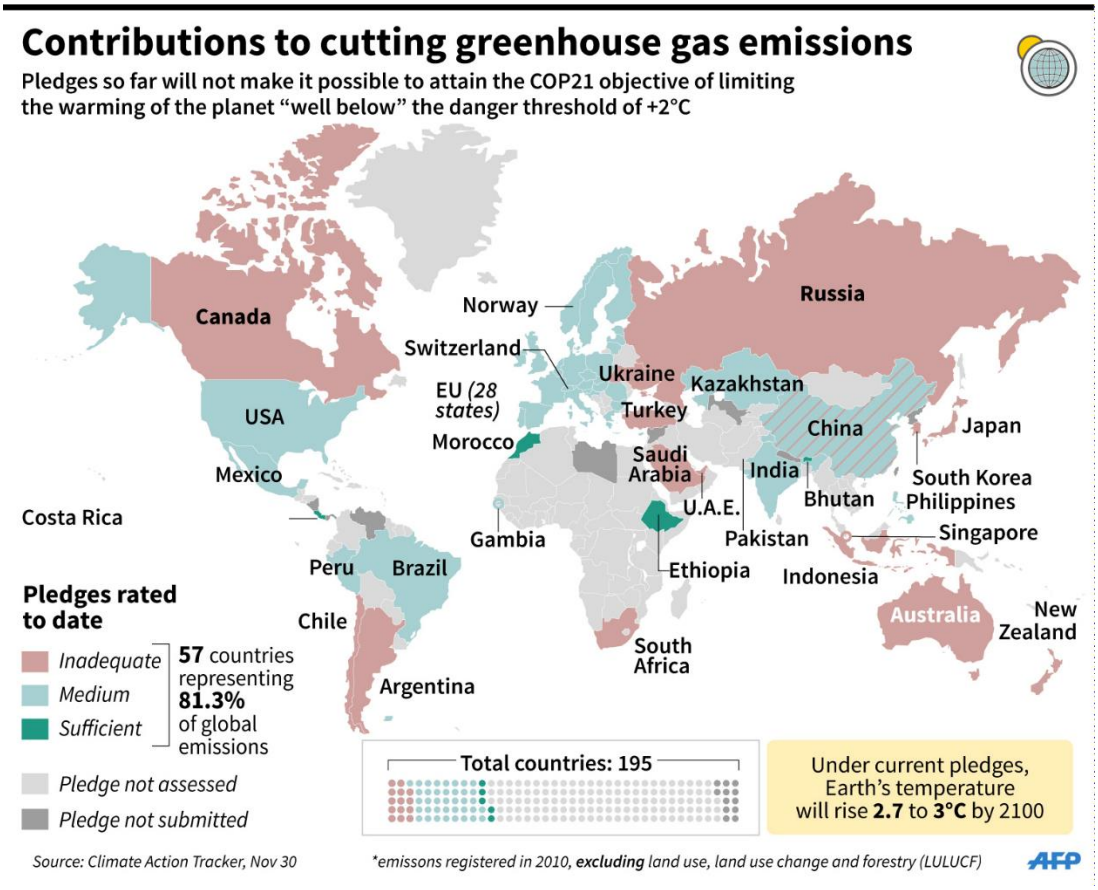
The amendment included:

- 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.







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.

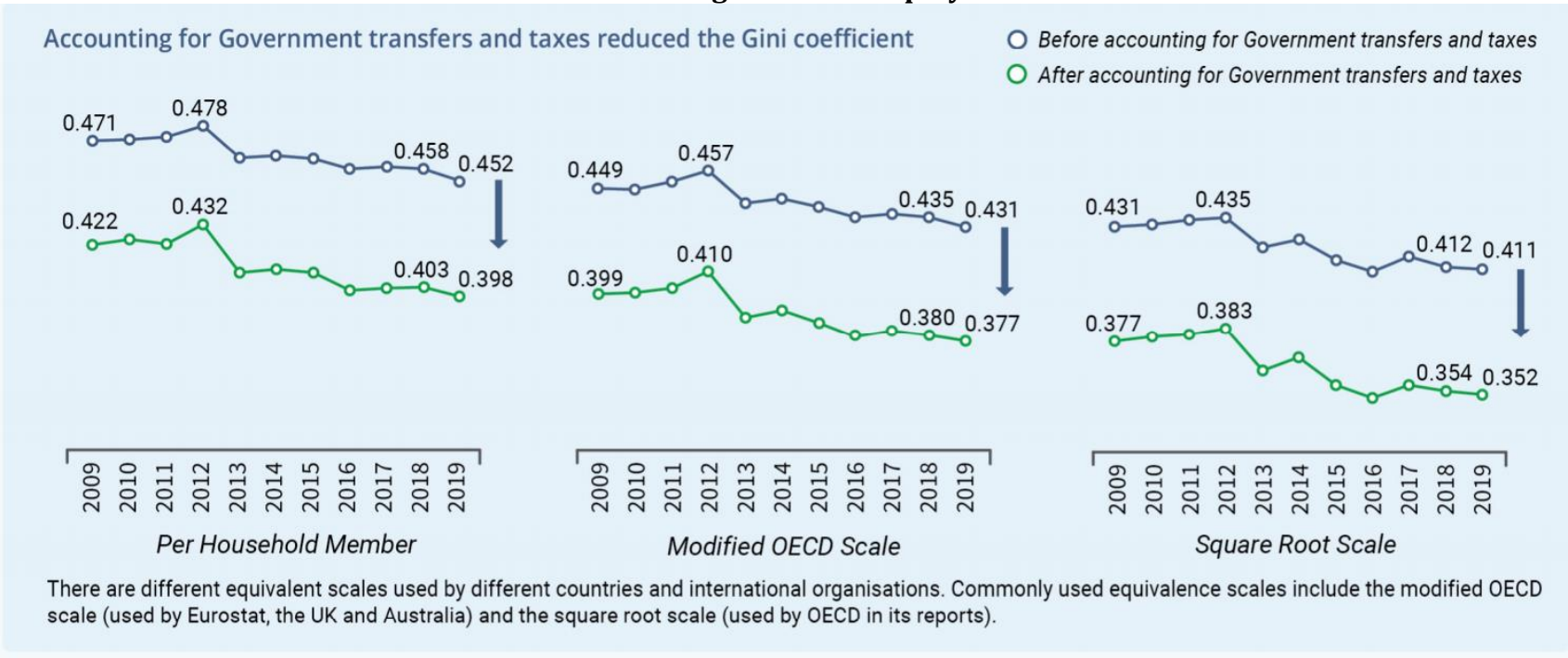
Green Transport
More than 100 national governments, cities, states and major car companies signed the Glasgow Declaration on Zero-Emission Cars and Vans to end the sale of internal combustion engines by 2035 in leading markets, and by 2040 worldwide. At least 13 nations also committed to end the sale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

5.7. 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.

Gini Coefficient Among Resident Employed Household



Source: www.singstat.gov.sg