

1. Public Goods

1.1. The Free-Rider Problem and Complete Market Failure

Public goods are goods with features of non-rivalry and non-excludability in consumption and thus, would not be provided by the free market.

Non-excludability suggests that it is technically impossible or economically unfeasible to exclude anyone from the benefit of the good once it is provided. In the case of street lighting, it is impossible to provide the lights and yet prevent passers-by from enjoying the benefits from seeing the light. Hence, once street lighting is provided, it will benefit everyone who walks under it, regardless of whether the person has paid for it or not. Since non-payers would be able to enjoy the benefits of street lighting for free, this would deter anyone from deciding to pay for it in the first place and this creates the free-rider problem. Thus, the demand for public good is concealed. Therefore, in a free market, there is no price signal for producers to charge a price and given there are costs of providing the good (thus making a loss), producers will not allocate resources to produce it i.e. under allocation of resources causing allocative inefficiency.

Non-rivalry suggests that the consumption of the good by one person does not reduce the benefit of the good available to others. In the case of street lighting, when one person walks under the streetlamp, the brightness level will be the same as when two or three people were to walk under it. This suggests that an additional consumption of the good does not deplete its benefits. Hence, the marginal cost (MC) of providing street lighting for an additional user is zero. To achieve allocative efficiency where $P = MC$, street lighting has to be provided at no charge i.e. $P = 0$. However, no private firms will be willing to produce street lights at $P = 0$ given there are costs of providing it. Alternatively, if they were to provide street lights, they would have to charge a price above zero. If so, $P > MC$ thus resulting in allocative inefficiency. Therefore, in a free market, allocative efficiency cannot be achieved due to non-rivalry of street lights.

Overall, given that street light is a good that has net benefits to the society but it will not be provided in a free market, there will be complete market failure (i.e. maximum deadweight loss) as the price mechanism fails to allocate resources efficiently to produce street light i.e. allocative efficiency is not achieved.

* There is not really any analysis of government policy to address market failure as a result of the failure of the free market to allocate resources to produce public goods since the only policy is for the government to provide the goods directly. Hence, cost-benefit analysis from Chapter 1 should be applied to determine what the socially optimal level of output is.

2. Externalities

2.1. Externalities in Consumption

Traffic congestion in Singapore caused market failure because of the negative externalities in consumption from the usage of roads.

Step 1: Before

- Consumers enjoy private benefits when they use roads such as lower time opportunity cost via shorter travelling time to reach destinations, illustrated by the marginal private benefit (MPB) curve.
- They incur private costs in consumption such as the cost of fuel needed to power the vehicles to commute via the roads, illustrated by the MPC curve.
- The free-market equilibrium is achieved at E_p where $MPB = MPC$ with free market output Q_p and free market price P_p .

Step 2: During

- However, the usage of roads exhibits negative externalities in consumption, which are spillover costs associated with the consumption of the goods to third parties who are not directly involved in the transaction of the goods and with no compensation involved.
- For example, there are external costs like the decrease in the productivity level of the economy due to the late coming as the workers are stuck in the traffic congestion thus productive time wasted. Since these are not internalised by self-interested consumers, there is a divergence between MPC and marginal social cost (MSC) by the amount marginal external cost (MEC).
- Assuming no external benefits, $MPB=MSB$ and the socially optimal level of consumption is Q_s where $MSC=MSB$ with output Q_s and price P_s .

Step 3: After

- Hence, since $Q_p > Q_s$, there is an over-consumption illustrated by distance Q_sQ_p .
- Between Q_sQ_p , $MSC > MSB$ so the additional social cost illustrated by area $A_{EsQ_sQ_p}$ is larger than the additional social benefit illustrated by area $E_pE_sQ_sQ_p$.
- Hence, there is an over-allocation of resources to the consumption of roads. and the current combination of goods and services produced and consumed does not allow the society to attain the greatest level of satisfaction since there is deadweight loss illustrated by triangle A_{EsE_p} . Hence, there is allocative inefficiency and market failure.

2.2. Externalities in Production

The provision of street lighting also caused market failure because of the negative externalities in production from the generation of electricity and from the effect of bright street lights on wildlife. Generation of electricity for street lights has private benefits in production such as **additional revenue (It is NOT the benefits of consuming the streetlamps. I.e. It is NOT “visibility at night” because it is externalities in production)** that firms enjoy when producing electricity for streetlights. It also has private costs in production such as the cost of electricity to power the street light. The private benefits and private costs can be illustrated by the marginal private benefits (MPB) curve and marginal private costs (MPC) curve in Diagram 1 respectively. The free-market equilibrium is achieved at E_p where $MPB=MPC$ with free market output Q_p and free market price P_p . However, the generation of electricity exhibits negative externalities in production. **Negative externalities in production are spillover associated with the production of the good to third parties who are not directly involved in the transaction of the good and which have no compensation involved.** Exemplify who are the third parties and what are the external costs to them: In the case of the provision of street light, there could be external costs incurred to wildlife dependent **communities (It must be a human stakeholder because you cannot tell how much cost is incurred by an animal since you cannot talk to animals.)** in terms of losses in income due to adverse effects of bright street lights on wildlife e.g. causing them to go into hiding. There could also be external costs from the generation of electricity. For example, **farmers** would suffer losses in income due to more frequent flood / drought because of global warming arising from the emission of carbon from the burning of fuel into the atmosphere to generate the electricity needed to power street lights. Because the external costs are **not internalised** by those directly involved (i.e. consumers and producers of electricity who are assumed to care only about their own private benefits and costs i.e. self-interested), there is overproduction of electricity to power street lights. In the market for electricity, the existence of external costs from the generation of electricity suggests that there will be a divergence between MPC and the marginal social cost (MSC) by the amount of marginal external cost (MEC) at every output level. Assuming no external benefits and hence marginal external benefits is zero (i.e. $MEB=0$), $MPB=MSB$. Social optimal is achieved at E_s where $MSC=MSB$ with output Q_s and price P_s .

At Q_p , the opportunity costs of producing electricity to society illustrated by Mc is larger than the value the society places on producing electricity illustrated by Mb . Therefore, there is an overproduction illustrated by distance Q_pQ_s . Since $Q_p > Q_s$, there is an over-allocation of resources to the production of electricity from society's point of view. This results in additional social costs illustrated by area $A_{EsQ_sQ_p}$ that is larger than the additional social benefits illustrated by area $E_pE_sQ_sQ_p$. Therefore, in a free market of electricity generation, the current combination of goods and services produced and consumed does not allow the society to attain the greatest level of satisfaction as illustrated by the deadweight loss triangle A_{EsE_p} , hence there is allocative inefficiency. The free market thus fails to allocate resources in an efficient manner.

3. Information Failure

3.1. Imperfect Information

If left to the free market, it is also likely that healthcare will be under-consumed because individuals underestimated the private benefits in consumption to themselves due to imperfect information. They may be unaware of the full benefits of identifying their illnesses early. For example, health screenings can identify major illnesses in their earlier stages, giving patients a greater chance of recovery with early treatment thus they can better enjoy better living and save on hospital bills arising from prolonged treatment. With reference to Diagram 2, due to imperfect information, there is a divergence between $MPB_{perceived}$ and MPB_{actual} . When consumers undervalue the true benefits of consuming healthcare to themselves, they will consume at Q_P units, where $MPB_{perceived} = MPC$. However, if the consumers have perfect knowledge, they would consume at a higher output, Q_{Qa} , where $MPB_{actual} = MPC$. Hence, with imperfect information, similar to the case of positive externalities in consumption explained above, there is thus an under-consumption of $Q_P Q_s$ units of healthcare. The society will be better off if these additional $Q_P Q_s$ units were consumed since the additional social benefit represented by the area $Q_P C B Q_s$ outweighs the additional social costs represented by area $Q_P A B Q_s$ (Do not need to repeat if you have already done the same analysis earlier). The under consumption would lead to a deadweight loss of area ABC and thus there is allocative inefficiency. The free market fails to allocate resources efficiently and thus government intervention is necessary to address the market failure.

3.2. Asymmetric Information

Adverse selection occurs when asymmetric information between buyers and sellers of a product causes one of the parties to make suboptimal choices that result in lower welfare and thus an inefficient market outcome. In the used car market, sellers of cars will have more information about the condition of the cars than buyers. In order to maximise profits, some sellers may conceal the fact that their cars are lower quality from buyers. Hence, buyers will take into account that there is a probability that they will purchase an inferior car, making them less willing to buy the car. Hence, buyers are only willing to buy at a lower price. At this lower price, sellers who are selling cars of relatively higher quality will be less willing and able to sell their cars and leave the market, while sellers who are selling cars of relatively lower quality will be extremely willing to sell their cars. The market is hence saturated with sellers of lower quality cars and buyers will be more likely to buy a poor quality car at a higher price than they would have been willing to pay if they had perfect information about the car. In the long run, if all sellers of higher quality cars leave the market, there is a missing market for higher quality cars. Hence, the marginal cost to buyers will be higher than their marginal benefit and there would hence be welfare loss and market failure.

Moral Hazard is the situation in which economic agents take greater risks than they normally would because the resulting costs will not be borne by them, but instead the cost is shifted onto the other party. In the insurance market, after the signing of insurance contracts, a profit-maximising shop owner is incentivised to take less costly safety precautions with the running of his store because he knows that any damages incurred will be covered by the insurance company. Hence, because of the increased likelihood that accidents may happen in the shop, the insurance company is more likely to incur higher costs. Hence, the insurance company, having insufficient information about how different shop owners run their stalls, will charge higher premiums to cover the risk of a negligent shop owner. Careful shop owners hence face a higher price than they should. This means that the marginal cost of buying insurance to a careful shop owner is higher than the marginal benefit and hence there will be welfare loss and market failure. In the extreme case, insurance firms may leave the market entirely, resulting in a missing market for insurance and a maximum loss in welfare as no consumer is able to enjoy the benefits of insurance.

4. Market Dominance

4.1. Monopoly Power

The price of a unit of a good by consumers is the price they offer for that unit of the good, which indicates the level of satisfaction they derive from consuming that good. (Contextualise what the benefit is). Hence, the average revenue (AR) curve illustrates the marginal social benefit. The marginal cost (MC) of production of a good is the additional cost incurred for the production of an additional unit of a good (Contextualise by saying cost of what type of resource), which represents marginal social cost. Therefore, the socially optimal level of output Q_{PC} occurs when $AR = P_{PC} = MC$. In a market dominated by a few firms or one firm due to the existence of high barriers to entry, a dominant firm will have a high market share, and hence have a high market power to allow them to restrict output to Q_M in order to set high prices of P_M in order to maximise profits at the profit maximising level of output where marginal revenue (MR) is equal to marginal cost (MC). Since $Q_{PC} > Q_M$, there is an underconsumption of the good, as the additional benefit to society from the consumption of Q_M to Q_{PC} units of the good, illustrated by area $E_M E_{PC} Q_{PC} Q_M$ is greater than the additional cost to society, illustrated by $a E_{PC} Q_{PC} Q_M$. Hence, there is a net benefit forgone by not consuming these units of goods. Therefore, there is an underallocation of resources to producing these goods and the inefficient allocation of resources is illustrated by the deadweight loss of area $E_M E_{PC} a$.

5. Factor Immobility

Factor immobility refers to the inability of a factor of production to shift from one use to another, even in response to large changes in demand and remuneration. In our syllabus, this largely refers to labour immobility, but theoretically it is not limited to that.

5.1. Occupational Immobility

Occupational immobility occurs when there are barriers to the mobility of factors of production. For labour, this could be due to a mismatch of skills to the job opportunities available. For example, when a country shifts its focus on production away from production of low value-added goods to high value-added goods, workers who are working in sunset industries like low-skilled manufacturing are likely to be retrenched as the derived demand for them falls when demand for low value-added products falls. If these workers are low-skilled and are unable to adapt or learn new skills in order to be hired by firms in sunrise industries like artificial intelligence development, then they may remain structurally unemployed. As such, not all the resources in an economy are being utilised in order to produce the maximum level of output with a given level of input, and therefore there is productive inefficiency in the allocation of resources, illustrated by the production of a point A within the PPC whereby society is not producing at the maximum attainable combination of the two goods. Hence, the level of societal welfare is not maximised, and therefore allocative efficiency is not achieved, causing the market to fail.

5.2. Geographical Immobility

Geographical immobility occurs when there is a lack of preparedness of people to move between and within countries in response to changes in the labour market either due to social costs or financial costs. When a country outsources its production of a particular good to another country for example, the existing firms producing the good will likely shift its production to that country or shut down. However, workers may not move to a different country if they feel that the marginal benefit of moving to the other country — the additional income they would gain from continuing to work this job — falls below the marginal cost of the decision. This could be the reduced contact with family and friends, resulting in a feeling of loneliness, or it could be the cost of finding new residence in the new country or travel to the country, as well as the cost of living in the country. As such, not all the resources in an economy are being utilised in order to produce the maximum level of output with a given level of input, and therefore there is productive inefficiency in the allocation of resources, illustrated by the production of a point A within the PPC whereby society is not producing at the maximum attainable combination of the two goods. Hence, the level of societal welfare is not maximised, and therefore allocative efficiency is not achieved, causing the market to fail.

6. Inequity

Equity is the fairness in the distribution of economic welfare such as the access to essential goods and services like healthcare services. The high price of healthcare, especially for secondary healthcare since it involves hospital bills, means that it may not be affordable to the lower income groups, resulting in greater inequity. If left to the free market, too much resources may be allocated to providing non-essential medical services for the rich and too little resources allocated to providing affordable healthcare for the lower income groups. Hence, low income individuals may be deprived of the essential healthcare and there is inequity in the resource allocation as it may not be fairly distributed to those who need it, resulting in possible government intervention.

* Inequity is **not** a source of market failure as it is not an issue of inefficient allocation of resources.

7. Policies to Address Market Failure

7.1. Direct Provision and Joint Provision

This may be a policy used to correct market failure caused by public goods or positive externalities in consumption or production.

In correcting the market failure caused by public goods, the government can consider direct provision, whereby it provides the public good by using its tax revenue from income tax, corporate tax or goods and services tax to pay for resources to provide the public good. In order to maximise societal welfare, the government will produce at a point Q_s , where marginal social benefit (MSB) which is (contextualised explanation) is equal to marginal social cost (MSC) which is zero due to the non-rivalrous nature of public goods as explained in part (a), as any reallocation of resources will result in lower societal welfare. This hence allows the good to be provided for free so that allocative efficiency is achieved when $P = MC = 0$, hence addressing the market failure. (Cost-benefit analysis)

The government can also consider paying private firms to produce the goods via joint provision, whereby it pays firms using its tax revenue from income tax, corporate tax or goods and services tax to produce the public good. In order to maximise societal welfare, the government will instruct firms to produce at a point Q_s , where marginal social benefit (MSB) which is (contextualised explanation) is equal to marginal social cost (MSC) which is zero due to the non-rivalrous nature of public goods as explained in part (a), as any reallocation of resources will result in lower societal welfare. The provision of funding for profit maximising firms allows them to receive a non-zero price, whereby they would profit from the provision of these goods. Hence, the good is provided for consumers at $P = MC = 0$, so that allocative efficiency is achieved to address market failure. (Incentivise)

The analysis for how joint provision and direct provision is used to address market failure caused by positive externalities is similar to that above, but the cost-benefit analysis is slightly different. It would resemble that of subsidies more.

Advantages:

- Government can decide the amount and quality of provision i.e., cutting edge defence systems and weapons, and the use of tax revenues ensures the financial burden is shared by its people.
- In the case of joint provision, private firms will try to minimise costs since the firms are profit-maximising, especially if they get a fixed fee from the government. This can ensure productive efficiency.

Limitations:

- Imperfect information. Governments may not accurately determine the socially optimal level of public good to ensure allocative efficiency. Because of the free-rider problem, it is difficult to ascertain consumers' demand for a product. The government does not know how much consumers truly value the public good because there is no price signal with which to evaluate whether to provide the public good and in what quantities. Hence, such difficulties in quantifying the costs and benefits of public goods are just estimates at best. If the government under-provides or over-provides a public good, welfare losses will result.
- Government budget constraint. Such government intervention results in increases in government expenditure, which may require raising taxes to finance spending on public goods. Spending on public goods incurs opportunity cost, e.g., new educational facilities foregone. In addition, the need to raise tax to finance the spending means that there will be distortions and deadweight losses associated with acquiring those taxes and society's welfare will be reduced.
- In the case of direct provision, managers in the public sectors are non-profit oriented, unlike in private firms. Hence, they might not have the incentive to minimise costs by sourcing raw materials from low-cost suppliers, resulting in productive inefficiency.
 - However, instead of being the producer, the government could provide the funding and outsource the production and maintenance of the public goods to private producers by awarding them contracts. These private producers are more efficient in minimising costs as compared to the public sectors since costs have a direct effect on profitability.

7.2. Taxes and Subsidies

Taxes and subsidies are typically used to address market failure caused by externalities and information failure

- The government can levy a specific pigouvian tax (tax to address negative externalities) at the socially optimal level of output that approximates the value of external costs (MEC) generated per unit of output.
- Through this tax, the government attempts to make the private economic agents internalise the external costs by increasing the marginal cost of producing the goods. (Depending on the type of tax, you should argue about the changes in price.) In Figure 3, a specific tax that is equal to BE_1 per unit will shift the MPC curve upwards to $(MPC + \text{tax})$, which coincides with the socially optimal equilibrium of E_1 . The result is that the private equilibrium output will decline so that it corresponds with the socially optimal level of output of OQ_S units.
- There would therefore be no overproduction of the good as $MSB = MSC$ and allocative efficiency is attained. The reduction in output results in the removal of the deadweight loss to society represented by area AE_0E_1 as the gain due to the reduction in production represented by area $E_1AQ_pQ_S$ offsets the loss due to the reduction in consumption represented by area $E_1E_0Q_pQ_S$. (Internalise and Incentivise)

The analysis for subsidies is similar to that of taxes. However, it is important to note that direct subsidies increase the benefit of consuming the good and increasing the benefit of producing the good while indirect subsidies lower the cost of consuming the good and lower the cost of producing the good. This will be argued based on the changes in market conditions.

- Fines imposed by CCCS on firms are a specific amount that has to be paid and this may negatively harm the profitability of these firms. Assuming the fines are at least equal to the increase in profit arising from the anti-competitive behaviours, the fines would remove any increase in profits from the anti-competitive behaviours so that firms cannot benefit from such practices.
- To deter firms from such anti-competitive behaviours, the fines should also have a punitive component to further reduce the profits of firms engaging in anti-competitive behaviours, disincentivising the firms from such practices. This is because the fines would effectively increase the marginal cost of anti competitive behaviours, making it less attractive compared to the marginal benefit in terms of the potential increase in profits.
- In the case of the chicken product market, chicken distributors are thus unlikely to continue with price collusion to restrict output to charge high prices while in the case of Grab, it may be more cautious of exploiting its monopoly power to raise prices. By discouraging collusion or the formation of a monopoly, the fines help to maintain fair competition in the market, which results in lower prices and higher output, thus addressing the issue of

underconsumption, which hence eliminates the deadweight loss and allows resources to be allocated efficiently to maximise societal welfare. (Internalise and Incentivise)

Advantages:

- Incentivises firms to find cleaner ways of production. Profit-maximising firms will have the incentive to conduct research and development to reduce marginal external cost (MEC), in order to reduce the tax amount they have to pay. The reduction in tax will hence reduce cost of production and thus increase profit levels earned by the firm. Thus, tax acts as an incentive over the longer run to reduce pollution. In addition, it is a source of revenue for the government. The additional tax revenue collected could also be used to conduct research and development to reduce pollution levels in the polluting industry.

Limitations:

- It is difficult to assess the exact monetary value of external costs at the socially optimal level of output (e.g. measuring the external costs generated by negative externalities like noise pollution), which in turn implies that the appropriate level of tax is difficult to determine. Too high a tax amount would lead to a less than optimal level of output, while too low a tax amount would still result in overproduction. For instance, a tax imposed at output OQP (where tax amount = AEO) will result in overtaxation and underproduction.
- Administrative costs of collecting the tax may be very high. Firms may also have the incentive to evade such taxes.
- Unintended consequence which is a regressive effect on lower income groups. Goods that have a price-inelastic demand (e.g. basic food that is a necessity) would lead to the lower income groups having to pay higher tax in relation to their incomes. This is because the quantity demanded of such goods does not change a lot in response to the change in price (due to the tax). This leads to the higher and lower income groups paying similar amounts of the tax absolutely, but the lower income group pays more as a percentage of their incomes. Therefore, there may be negative implications on the fairness in the distribution of goods and services, making it contribute to greater inequity. Even if the good is not a necessity good, consumer surplus falls.

7.3. Quotas and Bans

Quotas and bans are policies to address negative externalities in production and consumption, or imperfect information resulting in overconsumption or overproduction. If given the choice, do not select quotas or bans as a policy as there is very limited analysis. Hence, the analysis will largely describe how to address the causes of market failure.

Quotas aim to set the legal level of consumption or production of an activity or good to the socially optimal level, achieving allocative efficiency. A ban may be an appropriate policy if consumption or production generates extremely high external costs illustrated by the large divergence between MPC and MSC by the amount of MEC. (Fear of punishment) COE (Certificate of Entitlement) is a quota system aimed to set vehicle ownership at the socially optimal level by dictating that vehicle buyers must purchase a COE before buying the vehicles. The price of COE is determined by demand and supply thus with COE, the MPC of owning vehicles increases and vehicle owners are thus made to internalise the negative externality. And since COE prices are determined by market forces, it is thus allocated efficiently to potential vehicle owners based on their ability and willingness to pay the high costs involved. Moreover, with COE as a form of quota, the usage of the vehicles will be restricted to socially optimal level Q_s . Allocative efficiency is achieved thus correcting the market failure. (Internalise and Incentivise)

Advantages:

- There will be higher certainty in terms of the outcome. For example, if the government knows the output that is socially optimal, it can just set the quota at that level. This is in comparison to taxation where the government may not know how economic agents would react to the tax, thus less certain about the level of tax to impose to achieve the socially optimal output.
- It may also be better in a situation that is very dire and urgent (e.g. extremely high level of pollution that endangers lives) because of the certainty of its outcome and the speed it can be implemented.

Limitations:

- COE (Certificate of Entitlement) is a quota system aimed to set vehicle ownership at the socially optimal level by dictating that vehicle buyers must purchase a COE before buying the vehicles. The price of COE is determined by demand and supply thus with COE, the MPC of owning vehicles increases and vehicle owners are thus made to internalise the negative externality. And since COE prices are determined by market forces, it is thus allocated efficiently to potential vehicle owners based on their ability and willingness to pay the high costs involved. Moreover, with COE as a form of quota, the usage of the vehicles will be restricted to socially optimal level Q_s . Allocative efficiency is achieved thus correcting the market failure.

7.4. Tradable Permits

The government can use tradable permits to resolve negative externalities. Each firm is given a permit to emit a specific level of pollution. If the firm emits less pollution than what they are legally permitted to, the firm is given a credit. This credit can then be sold to another firm for a price, allowing the other firm to exceed its original limit while the first firm profits from the sale of the credit. Polluting firms internalise the externality of pollution as there is an opportunity cost of polluting, which is the profit they could receive by selling their permits. Firms that are able to reduce pollution at a lower cost compared to the cost of buying the permits in the market will have the incentive to reduce their pollution level and sell their excess permits. Firms that incur higher costs in reducing pollution compared to the cost of the tradable permits will find it more economical to buy the permits from the market instead of implementing the pollution control measures at higher cost. Hence, the overall level of emissions is restricted to whatever total amount all the tradable permits allow all firms to emit, ensuring that the production of the good is never allowed to exceed the socially optimal level. Hence, this eliminates the deadweight loss (apply analysis above). (Internalise and Incentivise)

- The principle of tradable permits can be used as the basis of international agreements on pollution reduction. Each country could be required to achieve a certain percentage reduction in a pollutant (e.g. CO₂ or SO₂), but any country exceeding its reduction could sell its right to these emissions to other (presumably richer) countries. Any parts of these quotas not used could then be sold.

Advantages:

- The government can determine definitively the total amount of permitted discharge according to the ability of the environment to absorb the pollutants; it can do this without any knowledge of the specific costs and benefits of individual firms. The market in tradable permits can then allocate the reduction in pollution to where it can achieve at least cost thus promoting efficiency. Firms that are able to reduce pollution at a lower cost compared to the cost of buying the permits in the market will have the incentive to reduce their pollution level and sell their excess permits. Firms that incur higher costs in reducing pollution compared to the cost of the tradable permits will find it more economical to buy the permits from the market instead of implementing the pollution control measures at higher cost. In this way, the overall pollution is reduced in the most efficient or least cost manner.
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Limitations:

- Giving firms a “right to pollute” is not morally right. Firms which find that the cost of the permits is lower than costs of eliminating pollution would buy more permits to pollute. As such, these firms might not have the incentive to reduce pollution. A cost-benefit analysis can be carried out and tradable permits may not be appropriate if the reduction in pollution brings about small benefits and yet results in significant abatement costs.

- It is difficult to decide how to allocate the permits to firms. If there are many polluting firms, regulators would be concerned about the administrative costs. It is also possible that one or two dominant firms may buy up permits in the market and refuse to trade them. This would then act like a barrier to entry for new firms and the permits could therefore contribute to non-competitive behaviour.
- Enforcement issues may develop as it means that the government would need to monitor and keep track of the amount of pollution produced by each firm to determine whether it is within the permitted levels, and determine the amount of credits each firm can sell or need to purchase. The administrative costs of monitoring the pollution levels of firms and taking enforcement actions on those that violate the permitted levels of pollution could be significant.
- High COE prices leads to vehicle owners driving excessively to maximise their vehicle usage especially when the owners have already paid for the COE by the sunk cost fallacy. This might worsen traffic congestion instead. With COE, it is also difficult to ensure that road usage is at the socially optimal level because COE is meant to control vehicle ownership per se and thus not targeted at managing road usage which is the root cause of traffic congestion.
- If COE prices become too high due to high demand, then an issue of equity might arise as lower income individuals who might need vehicles may now find owning a vehicle less affordable and owning vehicles might become a symbol of status.

7.5. Government Regulation

This may be used as a policy to address externalities or imperfect information. The analysis is generally a cost-benefit analysis which encourages economic agents to act optimally via fear of imprisonment or severe punishment, or alternatively, it could be a link to tastes and preferences in the case of information provision (advertisement, education, campaigns). Nonetheless, these paragraphs are rather brief. So you are not advised to select this point. However, there is a special case shown below. This cannot be used for positive externalities because the government would not logically want to reduce potential increases in societal welfare. (Fear of punishment and Tastes and preferences)

Government regulation is the process of controlling business activities through laws and administrative rules. The government can pass legislation to prohibit or regulate behaviour that imposes external cost. To prohibit or limit pollution for instance, legislation can be used in forcing potential polluters to bear the costs of more proper disposal of industrial wastes. Thus, polluting firms will then internalise the external costs, reducing the difference between MPC and MSC. For example, the government could enact a law such that it is compulsory for all producers to equip their factories with emission reduction devices to reduce pollution. These measures would reduce the MEC, reducing the divergence between MPC and MSC, illustrated by a shift of MSC from MSC_1 to MSC_2 where MEC is reduced to MEC_2 . Hence, the new socially optimal level is where $MSC_2 = MPB$ at Q_{s2} which is closer to Q_p , hence the deadweight loss is smaller, reducing market failure. Such action forces potential offenders, under the threat of legal action, to bear all the costs associated with their production. (Fear of punishment and internalise)

Advantages:

- Simple and clear to understand and are often relatively easy to administer. Inspectors or the police can conduct spot checks to see that the law is being obeyed.
- One major advantage of education is that if implemented effectively, mindsets would be changed and the effects would be long-lasting, thus no continuous measures need to be put in place.

Limitations:

- Enforcement of such laws or regulations may be difficult and expensive. The regulatory agency has to check factory by factory, firm by firm, how much and what kinds of pollutants are being emitted. In addition, for the law to be effective, the penalties for breaking the law must be sufficiently harsh. Moreover, the methods adopted to control pollution may be costly and must be included as part of the social costs of production. Hence, government agencies must estimate accurately the impact of their regulations in order to achieve the socially ideal level of production.

- Firms have no incentive to reduce pollution further than what is required by the law. If the regulation is too stringent eg. a complete ban, it may result in over-correction of the market failure and greater deadweight loss, as the good may become under-consumed instead.
- However, the benefits from these measures must outweigh the costs of implementing them. The effectiveness of public education and campaigns is rather uncertain and difficult to measure. Furthermore, changing mindsets through such means takes time, thus if the problem is serious, urgent and life-threatening, this may not be the best policy to use.

Adverse Selection

i. Investing in information

Buyers can invest in information that is provided by independent parties. For example, in the case above, the buyer can read up on the general information on different models and brands of cars. The buyer can also make use of the internet to find out the prices that certain used car models are selling for to have a general gauge on how much they should be paying. The most convenient way is perhaps getting a mechanic to inspect the car before purchasing it. The action of investing in information enables buyers to make a better decision in their purchases. Also see example of Health Products Bill in iv. Laws. (Tastes and preferences)

ii. Signals

Signals are an action taken by an informed party to reveal private information to an uninformed party. In the case above, the seller of the used car could provide a signal that the used car is in an excellent condition. The seller can do so by offering a warranty which guarantees that for the next six months the seller will fix any defects in the car. This warranty acts as a signal that this car is in good condition otherwise the seller would not dare to provide such a costly warranty. Also see example of registration of private schools in iii. Screening. (Tastes and preferences)

iii. Screening

Screening is an action taken by an uninformed party to induce an informed party to reveal information. For example, in the above example, the buyer can ask for a mechanic to check the car before purchase. Another example would be in the case of purchasing insurance. Insurance companies often ask customers to undergo a medical examination before agreeing to insure the individual. These actions force the informed party to provide the information needed by the uninformed party to make better decisions. Private schools are required to register with the Ministry of Education. Although MOE does not screen the quality of these schools, it approves the registration based on some basic statutory requirements, such as building and fire safety requirements, acceptable curriculum, and qualified teachers. Such registrations also function as a signal for the consumers to know that these schools meet the basic statutory requirements. (Fear of punishment or tastes and preferences)

iv. Laws

In Singapore, the Consumer Protection Fair Trading Act (CPFTA) includes a provision for a 'lemon law'. This law allows for the replacement or repair of a product whose defect surfaces within 6 months of purchase, failing which, a price reduction or a full refund would be required. The law prevents retailers from selling defective products, protecting the consumers. Another way of protecting consumers is by establishing industry standards that the product must meet a certain requirement before they are put up for sale. This prevents the dumping of defective products to retailers by manufacturers. Vendors can also be required to disclose information about the product for sale such as the nutritional value on the labels on food. In Singapore, in early 2007, Singapore's Health Minister introduced the Health Products Bill in Parliament. The objective of this Bill was to protect the public and it is proposed that all health products including medical devices, pharmaceuticals, health supplements and traditional herbal medicine be evaluated and entered into a central registry, under categories determined by the Health Sciences Authority. This would help the public have more information about what they are purchasing and not buy products that could harm them. (Fear of punishment)

Moral Hazard

i. Incentives

One way in which insurance companies can reduce the problem of moral hazard is to offer incentives such as lower premiums or discounts for those with good track records. Insurance companies charge lower premiums for those who show that they take proper precautions against risks such as the installation of smoke detectors or fire extinguishers. Motor vehicles insurers offer a No-Claim Discount (NCD) on the premiums of buyers who have not made any accident claims on their vehicles. (tastes and preferences)

ii. Deductibles and co-payment

Another possible solution is to make use of deductibles. Deductibles are the initial amount of money that the insured party needs to pay before the insurance company pays for the rest. In the case above, if the shop owner knows that he/she will have to pay for the loss should a fire break out, they may take more precautions to prevent a fire from happening. Another solution adopted by insurance companies is co-payment, whereby the insured party has to pay part of the cost should a claim be made ie. the insurance company only covers a portion of the amount to be claimed. For example, in the case of medical insurance, the insurance company may only cover 80% of the medical bill, while the insured party has to pay the remaining 20% of the costs. Such deductibles and co-payment schemes make the insured party bear part of the cost should a claim be made, thus disincentivising the risky behaviour and reducing the moral hazard. (Internalise and Incentivise)

Factor Immobility

i. Improving the information flow

Provide information on jobs to those looking for work and put firms in touch with possible suitable labour. (tastes and preferences)

ii. Training of workers through skills upgrading programmes

Equip workers with the necessary skills to be re-employed in the production of other goods and services. (Tastes and preferences)

iii. Improving infrastructure or transport system

This may reduce travelling time between areas or enhance living conditions to make relocation easier, thus addressing geographical immobility. (Tastes and preferences)

iv. Providing incentives

Provide incentives for workers to upgrade themselves or to relocate to another area. (Internalise and Incentivise)