THEME 2: FIRMS' STRATEGIES AND MARKET FAILURE
SYLLABUS CONTENT (H3)

Theme 2: Firms' Strategies and Market Failure	
Theme 2 examines strategies and decisions made by firms to achieve their objectives. These strategies include game theory strategies and other strategies to develop competitive advantage, counter risk, uncertainty and asymmetric information. With reference to quasi-public goods and asymmetric information, candidates will be able to examine market failure and evaluate strategies and policies.	
Economics Content	
2.1 Firms' Strategies	**Additional Information**
2.1.1 How firms make decisions and develop strategies to achieve their objectives a. Strategies to develop competitive advantage in consideration of the nature and competitive intensity of the market through analysis of competitive rivalry within an industry, bargaining power of suppliers, bargaining power of customers, threat of new entrants and threat of substitute products b. Strategies with respect to other firms' decisions (including strategies arising from game theory and the economics of cooperation: prisoner's dilemma, Nash equilibrium)	Only analysis of equilibrium in pure strategies for Game Theory is required. Detailed technical analyses of Game Theory are not required.
2.2 Market Failure	
2.2.1 Quasi-public goods a. Issue of common resources (the tragedy of the commons) and significance of clearly-defined property rights – Coase Theorem and tradeable permits b. Club goods 2.2.2 Uncertainty and asymmetric information a. Uncertainty and attitudes to risk (risk-averse, risk neutral and risk-inclined) b. Asymmetric information in relation to problems of adverse selection, moral hazard and principal-agent problem in product, insurance and labour markets c. Effects of uncertainty and asymmetric information on the decisions made by economic agents d. Strategies and policy measures to address problems of risk and uncertainty, and asymmetric information including insurance, monitoring, co-payment, signalling, screening and efficiency wages	Detailed technical analyses of risk, uncertainty, and asymmetric information are not required.

Anderson Serangoon Junior College
JC2 H3 Economics 2025

THEME 2: FIRMS' STRATEGIES AND MARKET FAILURE

CHAPTER 1: MARKET FAILURE

1. QUASI-PUBLIC GOODS

A. ISSUE OF COMMON RESOURCES (THE TRAGEDY OF THE COMMONS) AND SIGNIFICANCE OF CLEARLY-DEFINED PROPERTY RIGHTS

- **COASE THEOREM AND TRADEABLE PERMITS**

B. CLUB GOODS

2. UNCERTAINTY AND ASYMMETRIC INFORMATION

A. UNCERTAINTY AND ATTITUDES TO RISK

B. EFFECTS OF UNCERTAINTY AND ASYMMETRIC INFORMATION ON THE DECISIONS MADE BY ECONOMIC AGENTS

C. STRATEGIES AND POLICY MEASURES TO ADDRESS PROBLEMS OF RISK AND UNCERTAINTY, AND ASYMMETRIC INFORMATION

1. Quasi-Public Goods

In H2 Economics, students would have learnt the concepts of public goods, in the form of pure public goods which are both non-rivalrous and non-excludable. However, many goods thought of as public goods are actually quasi-public goods, i.e., near-public goods that only exhibit one of the distinguishing characteristics.

A useful introduction of quasi-public goods and how they are related to pure public goods can be found in a paper by the Local Government Forum (2008) of New Zealand, titled "Local Government and the Provision of Public Goods". The following paragraphs and the summary table (**Table 2–1**) have been adapted from this paper.

Table 2–1: Characteristics of goods and services

	Rivalrous in consumption →			
Excludability of consumption ↓		Low	Medium	High
	Low	**Public Goods**: Street lightings, traffic signs, parks, reserves and civil defence service	Low-use roads, footpaths and cycle ways	**Common Resources**: Wild fish in the sea, wild herbs in the forest, and fertile pastures
	Medium	Flood control service	Sports grounds	High-use roads
	High	**Club Goods:** Museums and galleries (during non-peak periods) and private golf clubs	Public libraries, swimming pools, indoor recreation facilities and public venues	**Private Goods:** Airports, public transport service, clean drinking water, rubbish disposal service, car park lots, cinemas and housing

There are various categories of quasi-public goods that only exhibit one of the distinguishing characteristics of a public good. For example, goods depending on infrastructure of fixed capacity (such as roads) can become so congested at a certain level of use that one additional person's consumption will affect the ability of others to make use of them. In this case, a high-use road becomes rivalrous in consumption. The list of public goods depends on the feasibility of excluding

non-payers and the transaction costs of charging for services. If it is technologically feasible and economical to charge for such services (e.g., through electronic road pricing), it may become excludable in consumption.

Flood control services, although non-rivalrous in consumption, are excludable at a reasonable cost. For these services, it is feasible to recover costs from the sector of the community that benefits from them since it is a very localised service that benefits a small group residing in the area. It is thus possible to exclude other non-paying users because of their geographical distance from the community.

Quasi-public goods such as club goods are excludable but non-rivalrous in consumption. A common example of club goods are private clubs and museums. Users can be charged by paying membership fees or purchasing entrance tickets. Museums are largely empty during off-peak periods and are considered to be non-rivalrous in consumption. Whether a good is rivalrous in consumption can vary across localities according to factors such as population size and level of use. For example, a specialised museum or art exhibition that brings together rarely seen items from around the world to the local population may be oversubscribed and, hence, become rivalrous in consumption.

Issue of common resources (the tragedy of the commons) and significance of clearly-defined property rights

Common resources are goods/services that are non-excludable (difficult to stop non-paying individuals from consuming) and rivalrous (an extra user diminishes the quantity of the good/service). Some examples of common resources include clean water, trees in the rainforests and fish in the sea.

The tragedy of the commons

"The Tragedy of the Commons" is an influential article written by Garrett Hardin (1968) who uses a metaphorical story to illustrate the dilemma faced by individuals when presented with common resources. In this story, there are a large number of herders sharing a common plot of land (the commons) and they are all entitled to let their cows graze on the land. Each herder gains income and satisfaction from rearing an extra cow. However, the damage done to the land is shared by all the herders. To the individual herder, the amount of income and satisfaction he gains outweighs the damage done (as the burden is shared by all) and it will be in his interest to keep rearing more cows. The net effect of each individual herder behaving in his own self-interest is that the land is over-grazed and eventually damaged beyond repair.

The tragedy of the commons is actually a variant of the classic prisoner's dilemma situation; the twist being that there are multiple players instead of just two. In a simplified example, let us consider only two players: Herder A and Herder B. Rearing an extra cow gives a herder $1, but

the damage the extra cow does to the land is worth $1.20. However, the damage done to the land is shared between the two herders (-$0.60 each). If both herders rear an extra cow, each will bear $1.20 of damage to the land but only gain $1, resulting in a payoff of -$0.20. The respective payoffs and chosen strategies are presented in **Figure 2–6** below.

		Herder B	
		Don't Rear	Rear
Herder A	Don't Rear	$0, $0	−$0.60, $0.40
	Rear	$0.40, −$0.60	−$0.20, −$0.20

Figure 2–6: The Farmer's Dilemma

As can be seen from the above figure, the Nash equilibrium occurs when both herders choose to rear an extra cow each. If one thinks of the cost to the land as a long-run cost and the gain from rearing the cow as an immediate gain, the (Rear, Rear) outcome becomes even more likely. We thus arrive at a situation where they are collectively worse off because each herder chooses to act in his own self-interest. Ideally, they would be collectively better off in the long run if both choose not to rear the extra cow.

In "The Tragedy of the Commons", there are more than two herders behaving in their own self-interests. We thus have a multi-person prisoner's dilemma; this ultimately causes the land to be destroyed as each person thinks that the damage he is doing is being shared by the rest. Suppose we have 100 herders and we use the payoffs from our two-person example – the total damage done to the land would equal to 100 × −$1.20 = −$120. The net damage (total damage minus the benefit of rearing extra cows) is 100 × $1 + 100 x −$1.20 = −$20. Therefore, the greater the number of herders, the greater the damage done to the land.

Revisiting the Fallacy of Composition

The tragedy of the commons is a classic example of the fallacy of composition. The fallacy of composition states that what is true for individual parts of a system may not be true for the whole system. For example, it would be in a fisherman's best interest to catch as many fish as he can in a day. However, the fish in the sea can be considered a common resource – rivalrous but non-excludable. If all fishermen take the same decision, this may lead to overfishing and a decline in the fish population over time as the birth rate of the fish population is insufficient to replace the fish that are being caught. In the long run, fishermen may end up losing their livelihoods even though they may be maximising their profits in the short run.

Measures to protect common resources

- **Restricting the number of people (or users):** Clear rules could be established to identify who has the right to use the common resource. This could be achieved through some central authority selling a limited number of memberships. These memberships can, in turn, be traded in the open market.
- **Issuing of property rights:** Property rights could be issued or sold to people who use the common resource. It will thus be in the interest of the person who owns the property rights to ensure the common resource is kept sustainable. For example, if the herders in "The Tragedy of the Commons" had ownership over the land, the damage done by rearing an extra cow would be borne solely by the herder instead of being shared by the rest. This would provide the land owner with an incentive to behave responsibly. However, assigning of property rights is not always a feasible option. For example, there are some areas in the open seas that are not under the jurisdiction of any national government; property rights are difficult to enforce in such areas.
- **Legislation defining permissible and forbidden actions:** Legislation could be used to restrict the time of use (open or closed seasons for fishing or requirements to let the land lie fallow for a specified period), location (fixed areas where fishing or hunting is allowed) and technology (limiting the size of fishing nets). Legislation can also be used to set limits to the amount or fraction of resource that can be taken away. For example, loggers are only allowed to cut down a certain number of trees each month.
- **Good enforcement of legislation:** A good system to detect the violation of legislation must be set in place. Besides the hiring of guards, a better method would be to make detection automatic in the course of a user's normal routine. For example, some countries have a requirement that harvesting wood from the forests must be done in teams. Thus, each user monitors the other and this eliminates the need to employ guards. Legislation also needs to be designed in accordance with feasible and cost-effective methods of detection. For example, in the conservation of wildlife, it would be easier to designate an entire area as a nature reserve as compared to setting a quota to the quantity of game each hunter can hunt.

  Punishments for violation of the law must be made clear and understood by all users. They must also be severe enough to be a source of deterrence. Punishments range from verbal warnings, fines, loss of future rights and even imprisonment in severe cases (Dixit & Nalebuff, 2008, p. 96). The severity of each punishment can also be adjusted. A good principle to adopt is the graduation of punishments. First offences are normally met with warnings, while subsequent offenses are normally met with fines which are ratcheted up exponentially.

Coase Theorem and Tradable Permits

Can the problem of externalities be resolved without government intervention? According to the Coase Theorem (named after Nobel Laureate Ronald Coase who first proposed it in the 1960s), as long as property rights are assigned, no government intervention is required to deal with externalities (Rosen & Gayer, 2008). With property rights assigned, the allocation of resources will be efficient when the parties to an externality situation can bargain with each other at low or no cost. The private market thus moves towards the socially optimal output level on its own.

Three conditions need to be satisfied before the Coase Theorem can be applied:

- Well-established property rights.
- Low costs of negotiation.
- The externality must be well-defined.

Consider a simple scenario with two parties involved. A bottle maker owns a factory that is located by the river. The more bottles he produces, the greater the pollution to the river (this is the marginal damage). A fisherman also uses the river to catch fish. He is directly affected by the pollution caused by the bottle maker. The more bottles produced, the greater the marginal damage to the fisherman. Can they arrive at an efficient solution?

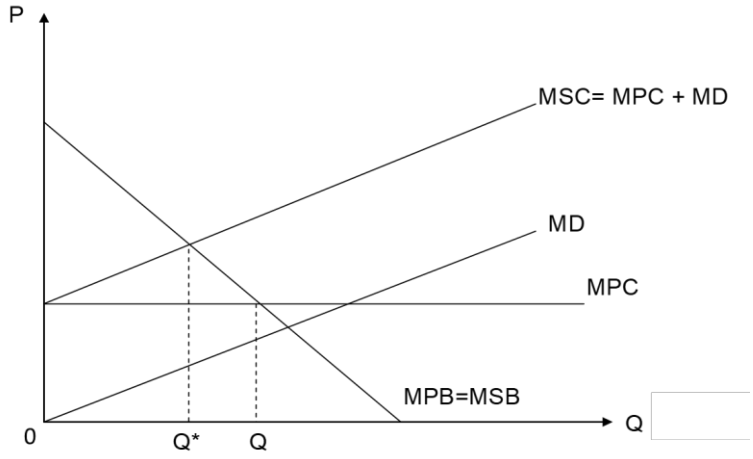

Figure 2–7: Private and Social Benefits and Costs of Bottle Production

In **Figure 2–7**, the marginal private cost (MPC) and marginal private benefit (MPB) belong to the bottle maker, and MD stands for the marginal damage that is done to the river as more bottles are produced. If left on his own, the bottle maker will choose to produce at output Q, as this is where MPC = MPB. However, the socially efficient output is at Q* where the marginal damage is taken into account and where marginal social cost (MSC) = marginal social benefit (MSB).

If the three conditions for Coase Theorem hold, then the fisherman and the bottle maker will be able to strike an agreement to reduce output to Q*. Note that this is independent of the party receiving the property rights.

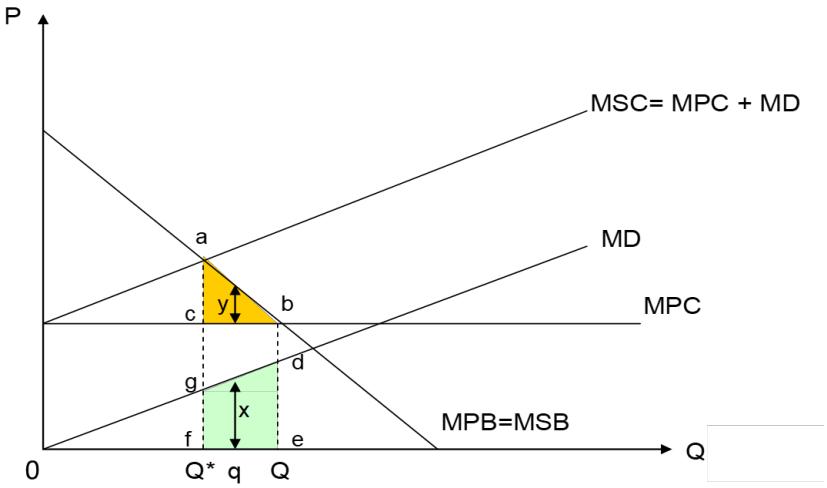

Figure 2–8: Bottle Maker With Property Rights

We first consider the case where the bottle maker has the property rights, with the aid of **Figure 2–8**. In the absence of any negotiation, the bottle maker will produce at MPB = MPC at an output level of Q. How does negotiation reduce output to Q*? The fisherman can offer to pay the bottle maker to reduce his output. The maximum amount the fisherman is willing to pay at each output level is equal to the marginal damage at that point.

The bottle maker will reduce his output if the payment he receives from the fisherman exceeds the net benefit he derives from producing an extra unit of output. At an output level q between Q and Q*, the fisherman is willing to pay a maximum of $x. The marginal net benefit for the bottle maker by producing that unit of output is $y. Since the loss in net benefit of reducing that unit of output is less than the compensation he receives, the bottle maker would agree to reduce output.

As we move left from the private equilibrium quantity Q towards the social equilibrium quantity Q*, compensation to the bottle maker is always larger than the marginal net benefit forgone. This induces the bottle maker to reduce output. However, at the socially optimal quantity of Q*, the bottle maker has no more incentive to reduce output as the marginal net benefit (distance ac) is exactly equal to the maximum the fisherman is willing to pay him (distance gf). At quantities less than Q*, the marginal net benefit is always greater than marginal damage (which is the maximum amount the fisherman is willing to pay), and the bottle maker has no incentive to further reduce output.

Through the assignment of property rights to the bottle maker, we have arrived at the socially optimal level of output Q* by allowing the parties involved to negotiate with each other. Government intervention is minimal and solely confined to the protection of property rights.

The loss of net benefit to the bottle maker is given by area *abc*. The gain to society from the reduction in marginal damage is given by area *gdef*. As area *gdef* is greater than area *abc*, there is a net gain to society.

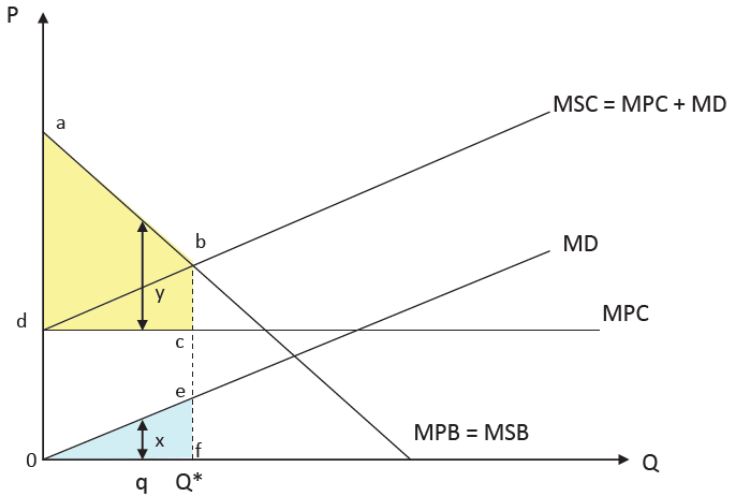

Figure 2–9: Fisherman With Property Rights

We then consider the case where the fisherman has the property rights, with the aid of **Figure 2–9**. The bottle maker now requires the fisherman's permission before he produces any output that pollutes the river. Production is initially zero and slowly increases till output level Q*. As long as the marginal net benefit is greater than the amount of compensation he has to pay, the bottle maker will pay the compensation to produce that extra unit of output. At output level q between 0 and Q*, the marginal net benefit $y is greater than the marginal damage $x (which is the amount the bottle maker has to compensate the fisherman for). The firm would thus be willing to produce an extra unit of output. This continues until an output level of Q* where marginal net benefit is exactly equal to marginal damage. At quantities more than Q*, marginal net benefit is less than marginal damage and the firm would not produce an additional unit of output.

The cost to the fisherman is given by area *ef0*. The benefit that the bottle maker gets is given by the area *abcd*. The benefit to the bottle maker is larger than the cost to the fisherman as area *abcd* is larger than area *ef0*. There is thus a net benefit to society.

In both cases, the socially optimal level Q* is reached through private bargaining regardless of who holds the property rights. The Coase Theorem thus implies that once the government manages to establish a strong legal system, which guarantees property rights, there is no need for government intervention to correct externalities.

The Coase Theorem only works when the three necessary conditions hold: the existence of well-established property rights; low cost of negotiation; and a well-defined source of externality. In many cases, at least one of these conditions is not fulfilled. For example, having a high volume of cars increases pollution levels in the city. Due to the large number of people involved, negotiation is likely to be impossible or extremely costly. The difficulty of establishing property rights for clean air also arises. When all three conditions are met, it is also problematic to decide who should get the property rights, as the one who owns the property rights will be better off as the recipient of payments from the other party.

B. Club Goods

Club goods in **Table 2–1** are excludable but non-rivalrous. Within a family household, a wireless Internet connection is a club good because all family members staying under the same roof share a password for its access; it is thus non-rivalrous to a certain extent. One person's enjoyment of the wireless Internet connection is not affected by others using it. Depending on the good in question, the sense of rivalry may depend on demand conditions. For example, a museum may be considered a non-rival good but should an external event (e.g., an artist making headlines) spark an interest in the museum, it creates more rivalrous in consumption.

In the introduction of Theme 2.2.1, **Table 2–1**, adapted from the Local Government Forum (2008) from New Zealand categorises services provided by some local governments according to their varying degrees of excludability and rivalry in consumption. The idea that the concepts of excludability and rivalry should be seen on a continuum, rather than as a dichotomy, should be an important takeaway for students. The goods towards the bottom right-hand corner of the figure are close to private goods, and there is little economic basis for their provision as public goods. Those towards the top left-hand corner have more of the collective characteristics of public goods, for example, street lighting, parks and reserves. In between these two extremes are activities with some public good features.

Some of them, such as local roads, have high rivalry that creates congestion, but sometimes is not currently technically feasible to charge for them at a reasonable cost. In other cases, funding via a mix of user charges and rates is appropriate.

2. Uncertainty and Asymmetric Information

A. Uncertainty and Attitudes to Risk

Note: Knowledge of utility functions is not required. The use of utility in this section is solely for the purpose of student understanding.

Up to this point, we have only been studying how economic agents behave under conditions of certainty. In reality, many decisions are taken under conditions of uncertainty. We have also conveniently assumed that all transactions are characterised by the availability of perfect information. In some instances, one party has more information than the other – this is called asymmetric information. You have been introduce to the concepts of asymmetric information in H2 Economics.

In this section, we will look at how decisions are made under conditions of uncertainty and imperfect information, their impact on efficiency and measures to address them.

Making decisions under uncertainty

Should a multinational enterprise (MNE) locate its manufacturing operations in a low-cost but politically unstable country? Should an oil tanker pass through the shorter route along the Gulf of Aden and run the risk of piracy or take a longer route and incur higher transport costs? Real life is fraught with uncertainty. How do economic agents make decisions under these conditions?

Before we proceed further, it is important to note that some books draw a distinction between risk and uncertainty. Risk refers to a decision-making condition under which the decision maker can list all outcomes and assign probabilities to each one. Uncertainty refers to a decision-making condition under which it is not possible to list all possible outcomes and/or not possible to assign probabilities to each outcome (Thomas & Maurice, 2008, p. 615).

A natural starting point would be to look at expected value. The expected value is the weighted average of all possible outcomes. Imagine that when your grandmother gives you a red packet, there is a 50 per cent chance you will get $50 and a 50 per cent chance that you will receive $100. What is the expected value of your red packet? It is calculated as follows:

Expected value = 0.5 × $100 + 0.5 × $50 = $75.

Now, consider that upon graduation, you have been given two job offers. In the first job, you will get a fixed pay of $2,000 a month. The second job offers a fluctuating monthly pay – there is a 40 per cent chance that you will get $1,000 and a 60 per cent chance that you will get $3,000. Which job offer should you take? If you base your decisions solely on expected value, you would take the second job offer. Why? The expected income of the second job would be 0.4 × $1,000 + 0.6

× $3,000 = $2,200. This means that, over many months, you would expect to make $2,200 per month on average. This is larger than the expected value of the first job (1 × $2,000 = $2,000) and based on the criteria of expected value, you would pick the second job.

However, this is not always the case as people tend to base their decisions on their expected utility rather than on expected value. Utility is a measure used by economists to quantify satisfaction. Put simply, different people get different levels of satisfaction depending on whether the income they receive is certain (i.e., a probability of 1) or uncertain (i.e., with some element of chance and variation in pay). People have different attitudes towards risk and this is the subject of our next section.

Different attitudes towards risk

Before we proceed, we need some basic knowledge of expressing utility as a function of income. We will focus on a graphical explanation; mathematical explanations will be kept to a minimum.

Risk-neutrality

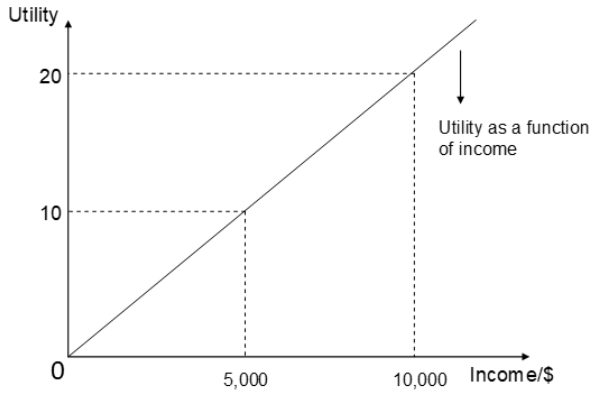

Figure 2–10: Risk-neutral Utility Curve

An obvious but important point to note from **Figure 2–10** is that the utility-income curve is upward sloping. As income increases, utility increases. This is common across all rational individuals, regardless of their risk attitudes. What separates risk attitudes is the *rate of increase of utility as income increases.*

The risk-neutral individual has a constant marginal utility of income and views an increment of $1 the same regardless of whether he has $0 or $10,000; his utility function is thus given by the straight line in **Figure 2–10** above. He is indifferent between the certain and uncertain outcomes in scenarios 1 and 2 as both give him the same expected value of $5,000 and also the same expected utility of 10. A risk-neutral individual would base decisions purely on expected value and

always pick the option with the highest expected value even if it is riskier. In other words, the individual will be indifferent between:

- $1,000 for certain; and
- $100,000 with 1 per cent probability, and $0 with 99 per cent probability.

Is this really the case for most individuals?

Note: Utility values given here are hypothetical and are provided solely to aid students' understanding. Deriving the exact utility values would require knowledge of the utility function equation, which we will not be teaching.

Risk-aversion

Does an extra dollar mean more to the beggar than to the millionaire? For most people, the answer would be yes. If that is the case, then we say that they have a decreasing marginal utility of income. This means that the additional utility one gets from the next dollar gets smaller and smaller. When an individual has a utility function with decreasing marginal utility of income, we say that the individual is risk-averse. A risk-averse person will reject scenario 2 because of the uncertainty it creates.

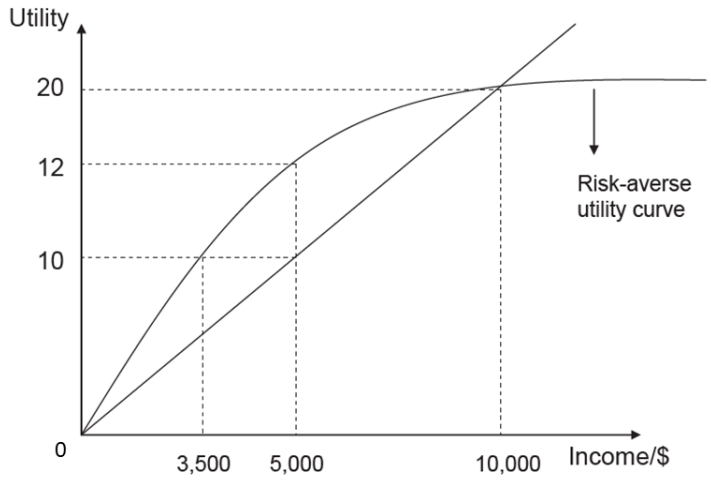

Figure 2–11: Risk-averse Utility Curve

If the individual receives $5,000 for sure (scenario 1), he gets a utility of 12. If the individual picks scenario 2, even though the expected value of $5,000 is the same as scenario 1, the expected

utility is 10.[1] This shows that the risk-averse individual prefers the certain outcome to the uncertain outcome for the same level of expected income. In fact, he is willing to accept up to $1,500 less because he dislikes uncertainty. From **Figure 2–11**, if he gets $3,500 for certain, his utility is 10. This is the same as the utility he would get if he took the risky alternative in scenario 2. We say that $1,500 is the risk premium.

Thus, it is shown that a risk-averse person's utility curve is concave, i.e., utility increases at a *decreasing rate* as income increases.

Risk-inclination

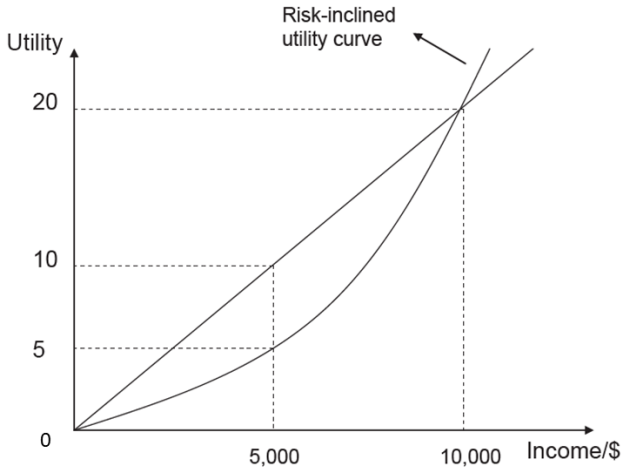

Figure 2–12: Risk-inclined Utility Curve

The risk-inclined or risk-loving individual is the polar opposite of the risk-averse individual. The risk-loving individual has an increasing marginal utility of income. This means that the additional utility per dollar gained gets higher and higher!

[1] This is because he gets a utility of 20 (associated with $10,000 income) with 50 per cent probability and a utility of 0 (associated with $0 income) with 50 per cent probability.

B. Effects of uncertainty and asymmetric information on the decisions made by economic agents

Asymmetric information refers to a situation where one party has more information than the other party involved in the economic transaction (Mishkin, 2007). This makes it difficult to make accurate decisions when conducting transactions. Asymmetric information is a special case of imperfect information. Asymmetric information interferes with the efficient functioning of a market.

The following sub-section will focus on adverse selection, moral hazard and the principal-agent problem, and how they impact decision-making by economic agents.

Adverse Selection

Adverse selection refers to a problem resulting from one party having more information than the other prior to the sale being made. In other words, there are *hidden characteristics* of the good or service *before* the transaction has been completed.

Adverse selection in product markets: The classic example of adverse selection in product markets is the lemons problem. This was outlined in a much-cited article by Nobel Prize winner George Akerlof (1970). He uses the market for used cars as an example and refers to low-quality cars as "lemons".

Potential buyers are frequently unable to assess the true quality of a used car. It could be a good car or a lemon that causes them much grief. Since the buyer does not know much about the quality of the car, he is only willing to pay a price that reflects the average quality of cars in the market. This is somewhere between the price of a lemon and the price of a good car.

In contrast, the owner of the used car knows a lot more about the car than the potential buyer. There is information asymmetry and the seller knows more than the buyer. If the car is a lemon, the seller would be pleased to sell it at the price the buyer is willing to pay. Recall that the buyer is willing to pay a price that reflects the average quality of cars in the market, which is greater than the lemon's value. However, if it is a good car, the owner knows that the car is undervalued at the price the buyer is willing to pay and so the owner would not want to sell it.

As a result of this information asymmetry, few good cars would be sold in the market. The only cars in the market would be the lemons and the average quality of used cars in the market would be very low.

Since no one wants to buy a lemon, there would be few sales. The used car market functions very poorly as a result. This is not economically efficient (nor Pareto efficient) as mutually beneficial exchanges between the two parties cannot take place.

How can a consumer be sure that he is getting a good quality product? Consumers can periodically refer to reviews in the press and magazines to ascertain the quality of a product before sale. Warranties can be used by firms to reduce adverse selection. A warranty sends the signal that the product is of good quality to the consumer. A firm selling low-quality products would not offer a warranty as they would have to pay high costs to honour their guarantee. Therefore, buyers view warranties as an indication of a good-quality product.

Adverse selection in labour markets: When firms hire workers, they are uncertain about the workers' abilities and their adequacy for the task. To hedge their risk, firms may offer a wage that is between their value of a high-ability and a low-ability worker. This may result in adverse selection as low-ability workers may self-select in response to the offered wage. It not only causes a redistribution of wages from high-ability to low-ability workers but also a reduction in total surplus involved if high-ability workers withdraw their labour in response to the (average) wage offered that is below the value of their marginal product. Similar to the earlier cases, firms have an incentive to try and obtain as much information as they can about prospective employees through the candidates' qualifications, résumés and interviews. This is also another form of screening. This way, firms can offer high wages to attract high-ability workers more confidently.

Adverse selection in financial markets: When the bank extends a loan, it cannot be absolutely certain that the loan will be repaid. The borrower has more information than the bank before the transaction. Banks try to reduce this information imbalance by requesting for details such as the customer's monthly pay, occupation and assets. This helps the bank screen out the bad credit risks. However, as interest rates dropped and credit became cheaply available in the years leading up to 2008, banks started giving loans to bad credit risks before repackaging these loans to other banks. A hot potato was passed on that eventually became too much for the global financial system to handle. Students can learn more about the financial crisis of 2008 in the next PCK idea.

Adverse selection in insurance: People who apply for medical insurance typically know more about their health risks than the insurer. The person of high-risk has the most incentive to apply for medical insurance. Since the person of low-risk is unlikely to suffer from severe health problems in the future, he has little incentive to apply. If left unchecked, most people in the market will be bad health risks. To circumvent this problem, potential customers of insurance agencies are often made to undergo a thorough medical check-up before they buy medical insurance for the purpose of setting premiums. Health insurance premiums are also pegged to a person's age, as younger people may be viewed as being of lower risk. The above set of solutions is also known as screening, to allow the seller of the insurance to gain more information on the buyer *before* the transaction.

Moral hazard

Moral hazards arise because an individual or institution does not bear the full consequences of their/its actions and, therefore, has a tendency to act less carefully than it otherwise would. This occurs because one party has more information than the other. Moral hazard is different from adverse selection, in that it is a problem of information asymmetry that arises after the

good/service has been sold from one party to another. In other words, there are *hidden actions* taken by the economic agents *after* the transaction has been completed.

Moral hazard in insurance: In the insurance market, moral hazard occurs when the party that is insured can affect the probability or magnitude of the event that triggers payment. When an insurance company offers protection to a customer, it does not know whether the customer will behave responsibly. This is because the customer has more information than the insurer about his own actions after the transaction. For example, after purchasing health insurance, an individual might have the incentive to pursue an unhealthy lifestyle of excessive smoking and alcohol consumption since someone else is going to pick up the tab for them. To prevent such behaviour, health insurance companies normally have a system of co-payment where the customer is required to pay a fraction of the medical costs while the insurer pays the rest. Motor insurance companies also encourage customers to stay out of traffic accidents. If drivers do not file any claims on their insurance for the year, they are entitled to a no-claims discount benefit by the insurance company on their premiums for the next year. Greater the number of years the driver does not file a claim, greater the percentage discount.

Moral hazard in product guarantees: Like insurance, a product guarantee reduces the customer's incentive to be careful with the product. If the laptop company is going to pay for all the repairs, it is likely that the customer will not take proper care of it. As such, most warranties only cover defects and not damage due to careless use. However, this is hard to enforce as most manufacturers find it difficult to distinguish between the two – the customer also has ample incentive to hide the truth.

Moral hazard in financial markets: With respect to the financial crisis of 2008, many argue that a government's bailing out of many troubled banks will create a moral hazard problem in the future. Since these banks are deemed too important to fail, there is an implicit guarantee that the government would rescue them should they run into trouble. This precedent action provides banks with an incentive to take on excessive risk as they become more confident that the taxpayer will pick up the tab should anything go wrong.

Principal-agent problem

The principal-agent problem is a special case of moral hazard where one party (agent) acts on behalf of another (principal) and is supposed to advance the principal's goal. The principal and agent have differing objectives and since it is the principal that bears the full burden of the agent's actions, the agent has an incentive to behave irresponsibly as the agent's work effort is not directly observable.

According to Sloman and Wride (2009), this problem can manifest itself in situations where a principal hires an agent to do a task. The reason why the principal hires the agent is because the agent knows more about the task than the principal, but this is exactly the root cause of the principal-agent problem. When people hire travel agents or property agents, these agents may not always act in the best interest of their clients. For example, travel agents are known to have special arrangements with speciality shops in the country of travel, and will often bring their clients (principals) to these shops, even if the clients have no interest in them.

Principal-agent problem in labour markets: Perhaps the most common example of the principal-agent situation exists in the labour market after the employee has clinched the job (meaning the transaction has already taken place). The job scopes specified in most contracts leave some room for discretion. It is also costly for the firm to monitor its employees continuously. As such, the employee has an informational advantage over the firm. He or she has an incentive to skive; it is the firm that suffers from the skiving. If the skiving is undiscovered, the employee will continue to get paid normally.

Executives (agents) of large companies often act on behalf of shareholders (principals). While shareholders are interested in increasing the company's value, the executives acting on their behalf could have different goals like increasing their pay or prestige.

Prior to the financial crisis of 2008, top bank executives were receiving phenomenally high pay packages. It was not uncommon for a top executive then to receive as much as 16 months of bonuses. They had ample incentive to take on many risky assets that looked good on their balance sheets in the short term (hence, justifying their generous pay). When these risky assets turned bad, the banks got into trouble and the shareholders saw the value of their stocks dive. Many top executives were fired, but not before receiving generous compensation packages.

To deal with the principal-agent problem, Sloman and Wride (2009) suggest two methods. First, companies could employ consultancy firms to examine the operations of the management to see how efficiently the company is run. Second, managers' salaries could be linked to the company's profitability. Some companies thus offer share options to their managers as part of their remuneration package.

C. STRATEGIES AND POLICY MEASURES TO ADDRESS PROBLEMS OF RISK AND UNCERTAINTY, AND ASYMMETRIC INFORMATION

Measures to deal with risk

Insurance: There are many kinds of insurance sold in the market: car insurance, health insurance, home insurance, etc. For most insurance types, one would typically have to pay the insurance company a certain amount of money every month or annually. Should the insured be unlucky enough to suffer a loss (of health or whatever one is insured against), the insurance company will compensate the insured fully for the loss.

How much should we pay the insurer? Suppose we have a farmer who has to transport his harvest across a dangerous valley to get to the market place where he can sell his crops. The valley is full of thieves and the probability that he gets robbed is 0.1. His crops are worth $28,000 and we assume the thieves do not hurt their victims. If he buys insurance, he will be compensated for his lost crops if he is robbed.

How much should the farmer pay the insurer? A fair amount to pay would be 0.1 × $28,000 = $2,800. If we have 10 farmers who all bought insurance, on average, there is a probability that only one of the 10 farmers will be robbed. The amount the insurer collects from the 10 farmers is $2,800 x 10 = $28,000. The amount the insurance company would have to pay, to compensate the one farmer who is robbed, would be $28,000. Notice that the insurer exactly breaks even if he charges each farmer $2,800 for the insurance premium. We call this amount the actuarially fair premium. Insurers typically charge higher than the actuarially fair premium due to the administration costs they incur.

Diversification: A second way to reduce risk for the risk-averse individual (most of us fall into this category) is through diversifying. This is the economic principle behind the old adage, "Don't put all your eggs in one basket." It is always wise to spread investments across different types of stocks, bonds and other financial instruments (Nicholson & Snyder, 2007, p. 151).

Suppose there are two risky assets, IT shares and oil shares. An individual has $2 to invest and each share costs $1 to purchase. If things go well, each share will give a return of $4. If things go badly, each share will only give a return of $2. There is a 50 per cent chance that things go well and a 50 per cent chance that things go badly for both industries. We further assume that the two shares are unrelated; that is, the fortunes of the IT industry are not tied to the oil industry and vice versa.

What should the individual do to maximise return and minimise risk? If the individual were to put all eggs in one basket and spend the entire $2 on shares in only one industry, the individual would get $4 for 50 per cent of the time, and $8 for 50 per cent of the time, giving an expected value of $6. For example, if two oil shares are purchased, the expected return would be 0.5 × $4 + 0.5 × $8 = $6. It is the same if two IT shares are purchased. Can one do better than the other?

		Information Technology: Good	Information Technology: Bad
Oil	Good	$8	$6
	Bad	$6	$4

Figure 2–13: Diversification Returns

A superior strategy would be to diversify and invest $1 in each industry. **Figure 2–13** shows all the possible returns we could expect if we pursue a diversification strategy. If both industries do well, the payoff is $8. The probability of that happening is 0.5 × 0.5 = 0.25.[2] If both industries do badly, the payoff is $4. The probability of that happening is 0.5 × 0.5 = 0.25. If oil does well and IT does badly, the payoff is $6. The probability of that happening is 0.5 × 0.5 = 0.25. Similarly, if IT does well and oil does badly, the individual would get $6 with a probability of 0.25.

The expected return, if this strategy is pursued, is 0.25 × $8 + 0.25 × $4 + 0.25 x $6 + 0.25 x $6 = $6. This is the same expected return as the first strategy of putting all eggs in one basket. However, the variability of returns is reduced with diversification. There is only a 25 per cent chance of getting either the extreme outcome of $4 or $8. There is a 50 per cent chance of getting the expected amount of $6. Diversification allows one to get the same average return at a lower risk.

Measures to counter asymmetric information

In our application of the various problems of asymmetric information to various markets, we have touched upon some solutions to mitigate them. Here, we provide a formal definition of what these solutions are.

- **Signalling** refers to the conveying of useful information from one party to another to reduce the problem of adverse selection. It is the party with more information that sends a "signal" to the party with less information. For example, job applicants typically provide employers with their educational qualifications and detailed résumés. These are meant to help employers more accurately gauge their ability. When a firm offers a warranty for a product, it signals to the consumer that the product is of good quality.

- **Screening** is another strategy used to combat adverse selection. In screening, the party with less information "acquires" useful information from the party with more information. There is a difference between signalling and screening. In signalling, the party with more information voluntarily provides the less-informed party with the information. In screening, the less-informed party makes it mandatory for the more-informed party to provide the

[2] We can perform this calculation if we assume that the two industries are independent of each other. The calculations can become quite complicated when we relax this assumption.

information before the transaction can take place. For example, when banks (the less-informed party) extend loans to borrowers (the more-informed party), the borrowers are made to reveal information pertaining to their ability to repay the loan. These include their occupation, monthly income and current assets (property, stocks, bonds, and so on).

- **Monitoring** refers to one party (the one with less information) obtaining information about the other party's actions after the transaction has taken place. This helps reduce moral hazard. For example, many companies which give out scholarships have access to scholars' school results. They also keep in constant touch with their scholarship recipients to make sure they are behaving responsibly.

- **Efficiency wages** are specifically meant to reduce moral hazard problems in the labour market. Efficiency wages are wages that are above market level. As the name implies, they are meant to improve employees' productivity. Higher pay increases the cost of a job loss, thus decreasing the incentive for employees to be lazy. In most high-paying jobs, a significant portion of employees' wages is based on performance (performance-based compensation schemes). This provides them with ample incentives to exert appropriate levels of work effort, reducing moral hazard in the labour market as a result.

Overall Conclusion For Theme 2

This theme extends students' learning of microeconomics from the H2 Economics syllabus. The first sub-theme focuses on firms and their decision-making process. Specifically, students are equipped with tools such as game theory and Porter's Five Forces model to think deeper about concepts such as mutual interdependence and profit maximisation that were introduced in H2 Economics.

In the second sub-theme, the focus shifts towards the government as an economic agent and its role in the provision of quasi-public goods. Students learn new tools to better understand the world of uncertainty and asymmetric information, and how different economic agents devise strategies to deal with these issues.

By the end of Theme 2, students should have gained a deeper appreciation of the decision-making processes of various economic agents, especially that of producers and governments. While many decisions made by these agents are definitely complex in nature, students should be equipped with sufficient frameworks to logically and systematically analyse decisions made by producers and governments in markets. Students should even be able to go one step further to propose solutions to economic issues faced by these agents.

References for Theme 2

Akerlof, G. A. (1970). The market for lemons: Quality, uncertainty and the market mechanism. *Quarterly Journal of Economics, 84*(3), 488–500.

Business Case Studies LLP. (2015). *Business case studies by company*.

Carbaugh, R. J. (2005). *Contemporary economics: An applications approach* (3rd ed.). Ohio: South-Western.

Case, K. E., & Fair, R. C. (2004). *Principles of economics* (7th ed.). New Jersey: Prentice Hall.

Dixit, A. K., & Nalebuff, B. J. (2008). *The art of strategy: A game theorist's guide to success in business and life*. New York: W.W. Norton & Company.

Foundation for Teaching Economics. (2015). *The fish game*.

Hardin, G. (1968). The tragedy of the commons. *Science, 162*, 1243–1248.

Hubbard, R. G., & O'Brien, A. P. (2008). *Economics* (2nd ed.). New Jersey: Pearson Education.

Kelly, G. (2014, February 20). 5 key reasons WhatsApp is worth $19 billion – To Facebook. Retrieved from https://www.forbes.com/sites/gordonkelly/2014/02/20/5-key-reasons-whatsapp-is-worth-19bn-to-facebook/?sh=23c67a9b60d9.

Leibenstein, H. (1978). On the basic proposition of X-efficiency theory. *American Economic Review, 68*(2), 328–332.

Local Government Forum. (2008). *Local government and the provision of public goods*. Christchurch: Local Government Forum.

Mankiw, G. (2015). *Principles of economics* (7th ed.). Connecticut: Cengage Learning.

McConnell, C. R., & Brue, S. L. (2008). *Economics: Principles, problems and policies* (17th ed.). Singapore: McGraw Hill.

McGuigan, J. R., Moyer, R. C., & Harris, F. H. (2005). *Managerial economics: Applications, strategies and tactics* (10th ed.). Ohio: South-Western.

Mishkin, F. S. (2007). *The economics of money, banking and financial markets.* New Jersey: Pearson Education.

Nicholson, W., & Snyder, C. (2007). *Theory and application of intermediate microeconomics.* Ohio: South-Western.

O'Sullivan, A., & Sheffrin, S. M. (2006). *Economics: Principles and tools* (4th ed.). New Jersey: Pearson Education.

Porter, M. (1979). How competitive forces shape strategy. Retrieved from https://hbr.org/1979/03/how-competitive-forces-shape-strategy.

Porter, M. (1998). *Competitive advantage*: *Creating and sustaining superior performance* (2nd ed.). New York: Free Press.

Rosen, H. S., & Gayer, T. (2008). *Public finance.* Singapore: McGraw Hill.

Shor, M. (2006). *Repeated prisoner's dilemma applet*.

Sloman, J., & Wride, A. (2009). *Economics* (7th ed.). Milan: Pearson Education.

Stalk, G. (1988). Time: The next source of competitive advantage. Retrieved from https://hbr.org/1988/07/time-the-next-source-of-competitive-advantage.

Stockman, A. C. (1999). *Introduction to economics*. Fort Worth: Dryden Press.

Thomas, C. R., & Maurice, S. C. (2008). *Managerial economics* (9th ed.). Singapore: McGraw Hill.