



**Anderson Serangoon Junior College
JC2 H3 Economics 2025**

THEME 1: RATIONALITY IN DECISION-MAKING

CHAPTER 1: RATIONALITY AND BOUNDED RATIONALITY IN DECISION MAKING

- 1. THINKING SKILLS FOR H3 ECONOMICS**
- 2. RATIONAL DECISION-MAKING, SHADOW PRICING AND
DISCOUNTING**
- 3. BOUNDED RATIONALITY**
 - A. LOSS AVERSION**
 - **ENDOWMENT EFFECT**
 - **SUNK COST FALLACY**
 - **STATUS QUO BIAS**
 - B. SALIENCE BIAS**
- 4. BOUNDED WILL-POWER & BOUNDED SELF-INTEREST**
- 5. APPLICATION OF THE USE OF BOUNDED RATIONALITY,
BOUNDED WILL-POWER & BOUNDED SELF-INTEREST BY
ECONOMIC AGENTS**
 - **NUDGE THEORY**

THEME 1: RATIONALITY IN DECISION-MAKING SYLLABUS CONTENT (H3)

Theme 1: Rationality in Decision-Making	
Theme 1 engages candidates in a more in-depth study of the decision-making process learnt at the H2 level. Candidates will examine how economic agents make decisions in a conventional economic model and how behavioural economics provides additional insights to the real-world decision-making process of economic agents. Through this, candidates will be able to provide the analysis and evaluation of consumers' behaviour, firms' strategies and microeconomic policies.	
Theme 1.1 Rational Decision-Making	
Economics Content	
1.1.1 Rational Decision-Making a. Maximisation of self-interest by economic agents b. Weighing of marginal costs and benefits	Additional information A broad understanding of discounting and shadow-pricing will suffice. Detailed technical analysis of the above concepts is not required.
Theme 1.2 Behavioural Economics	
Economics Content	
1.2.1 How decision-making by economic agents is affected by bounded rationality a. Loss aversion – Endowment effect – Sunk cost fallacy – Status quo bias b. Salience bias	Additional information Detailed technical analyses of behavioural theories and models are not required.
1.2.2 How decision-making by economic agents is affected by bounded will-power a. Time-inconsistent preferences and procrastination	
1.2.3 How decision-making by economic agents is affected by bounded self-interest a. Giving behaviour	Additional information An awareness of altruistic and non-altruistic reasons behind giving behaviour will suffice.
1.2.4 How economic agents can apply the knowledge of bounded rationality, bounded will-power and bounded self-interest to influence behaviour and achieve their objectives a. How nudges can influence the decisions of economic agents (Nudge Theory)	

THINKING SKILLS FOR H3 ECONOMICS

1.1 Introduction

In the study of H3 Economics, students often engage in independent research and would need to critically evaluate different references to develop an in-depth understanding of the topics. In a world where information is readily available for economic agents, an understanding of the pitfalls in the use of information is crucial for economic agents to refine their decision-making skills, to avoid making decisions that may seem irrational on hindsight.

It is important for students of H3 Economics to develop an awareness of statistical limitations (misleading comparisons and selection bias), the plausibility of the ceteris paribus assumption and common logical fallacies (fallacy of composition, post hoc fallacy and conjunction fallacy) to critically evaluate the relevance and validity of information given; economic principles, concepts and theories; and perspectives and decisions made by economic agents. As students analyse information, here are some important questions that they should consider:

- Economists frequently stress the assumption of ceteris paribus ' to what extent is this important and how feasible is this in the analysis of economic events?
- What are some logical fallacies that economic agents can fall prey to?
- What are some common pitfalls in the use of statistics?
- How can economic agents take advantage of appropriate and careful use of information to enhance their decision-making?

As they consider the questions listed above, it is also important for students of H3 Economics to consider and understand the nature and significance of Economics as a social science (as compared to the natural sciences) and the foundations of economic analysis (model, evidence and statistical anal

1.2 Plausibility of Assumptions

Ceteris paribus assumption: In Economics we often assume ceteris paribus (all other factors remain constant) when we study two or more variables of interest. When economic agents attempt to predict the outcomes of their decisions, knowledge that many other factors can simultaneously affect these outcomes is very important. As such, in establishing the impact of a decision, economic agents should seek to collect information on how various external elements can affect the outcome of a decision, and ensure that these elements are accounted for when predicting the outcome of the decision. However, by virtue of Economics being a social science, even with the use of advanced statistical software, it is not possible to hold all other factors constant. Despite this, the ceteris paribus assumption remains a useful abstraction that helps us simplify and understand social reality.

1.2.1 Common logical fallacies

Because economic decision-making often involves logical reasoning, understanding common logical fallacies enables agents to escape some of these common pitfalls. However, it is

unfortunate that logical fallacies are prevalent in popular economic discussions in the news media and elsewhere. As such it is important to be aware of these fallacies so that we can identify invalid arguments when we see them.

a. Fallacy of Composition

A **fallacy of composition** occurs when we conclude that what is true for a part is true for the whole (Case and Fair, 2004, p. 11). However, in actual fact, what is true for a part is not necessarily true for the whole. An individual spectator at a soccer match can see better by standing up while the rest remain seated. But if everyone stands, no one can see better.

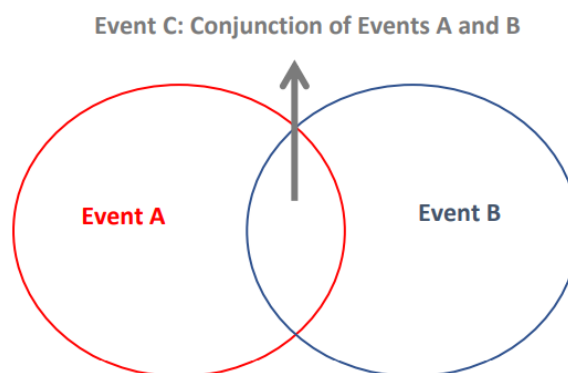
b. Post hoc Fallacy

A **post hoc fallacy** occurs when we erroneously conclude that since Event A happens before Event B, Event A caused Event B to occur (Case and Fair, 2004, p. 11). This train of thought is based solely on the order of events that happened, rather than to consider other potential reasons. As an example, suppose a firm decreases its prices and notices that sales of its goods decrease during the period of the price decrease. It thus concludes that the Law of Demand is false, and the price fall has caused the fall in quantity demanded of its products. This would be an example of the post hoc fallacy, if concurrent to the decrease in prices, there was a fall in income or tastes and preferences for firms's product, which overshadowed the positive effect of the fall in prices, causing sales to fall as a result.

c. Conjunction Fallacy

The **conjunction fallacy** occurs when people judge a conjunction of two events to be more probable than one of the events in a direct comparison. For example, if someone tells you that Jack went to a theme park with his daughter and rode the roller coaster, is Jack more likely to be just a man, or is Jack more likely to be both a man and also a thrill seeker? Most people would pick the latter based on the assumption that if Jack took the roller coaster, he must also be a thrill seeker even though the probability of two events is smaller than the probability of the single event, as illustrated in the Venn diagram in Figure A below.

Figure A: Conjunction in a Venn Diagram



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In an experimental study by Kahneman and Tversky (1983), evidence showed that people do fall prey to the conjunction fallacy.

Tversky and Kahneman (1983) used this example to illustrate conjunction fallacy: Linda is 31 years old, single, outspoken, and very bright. She majored in philosophy. As a student, she was deeply concerned with issues of discrimination and social justice, and also participated in anti-nuclear demonstrations. Which is more probable?

1. Linda is a bank teller.
2. Linda is a bank teller and is active in the feminist movement.

Interestingly, in repeated experiments by the authors, between 80% and 90% of respondents commonly choose option 2. This is Event C in the Venn diagram in Figure A above, with Bank teller as Event A and Feminist movement as Event B. From the Venn diagram, there is no way the overlap or conjunction of Events A and B can be bigger than Event A, yet a rich description of Linda in the example above seem to make people neglect this simple fact.

1.3 Statistical Limitations

Economists often use statistical analysis to draw inferences from raw economic data. The specific field where statistical methods are applied to Economics is called econometrics. It is thus important to understand some statistical fallacies so that we can correctly interpret statistical evidence.

1.3.1 Misleading Comparisons

A misleading comparison occurs when we compare two or more things in a way that does not reflect their true differences (Stockman, 1999, p. 26). A very important example of misleading comparison is failure to adjust for inflation. Politicians often claim that their tax cuts or government hand-outs are “unprecedented”; they fail to adjust for inflation when they make such comments. We commit this error when we compare the material standard of living of various countries by looking at per capita income. One US dollar in China can obviously buy a lot more than one US dollar in the United States. Economists therefore use Purchasing Power Parity (PPP) in their comparison to avoid this fallacy.

Another instance where misleading comparisons can be made is when economic agents commit the error of attributing false causality to events, where correlation is wrongly perceived as causation. When two variables change together, we say they are correlated. If they increase and decrease together, we say they are positively correlated. If one decreases when the other increases, we say they are negatively correlated. An important thing to note in Economics and other social sciences is that correlation does not imply causation. Misleading comparison can result when an agent mistakes correlation with causation. This is related to the post hoc fallacy discussed earlier. When we find that A is correlated with B, there are four possible outcomes:

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1. A caused B
2. B caused A
3. Either A or B, or both, are caused by some external factor
4. A and B moved together purely due to chance

Outcome 4 can be eliminated either via repeated experiments or more conveniently by a statistical technique that can calculate the probability that the two variables exhibit the same level of observed correlation if they are related in no other way except pure chance. If this probability is small, we can reject outcome 4. This leaves us with the first three outcomes, which we can further eliminate if our model is a good one. Looking at the first two, we are often (but not always) able to eliminate one of them if our model is logically robust. For example, if we are studying the relationship between mobile phone radiation and cancer; it is rather obvious that radiation could cause cancer and not that cancer caused the mobile phone to produce radiation.

To eliminate outcome 3, we can create a control group and a treatment group, slotting participants into different groups at random. In the treatment group, we study the effect of A on B as per normal. In the control group, we study how variable B changes without variable A; that is, we are studying whether variable B changes due to some external factors other than A. The assumption here is that variable B in the treatment group will be exposed to the same external factors (if any) as the control group. Reusing our mobile phone example and assuming we are not subject to any ethical guidelines, we can create two groups. In the treatment group, the participants are exposed to mobile phone radiation and we measure the number of cancer cases. In the control group, we do not allow them to use mobile phones at all and observe the number of cancer cases. In this control group, cancer could be caused by any other external factor but not mobile phone radiation. If the number of cancer cases in the treatment group is significantly higher than that in the control group, we can conclude with reasonable certainty that exposure to mobile phone radiation increases the likelihood of getting cancer. Thus, we can eliminate outcome 3.

Unfortunately, economists do not have this luxury; as a social science, it is difficult for Economics research to control for all possible causes and we can never eliminate outcome 3.

1.3.2 Selection bias

This occurs when people in the sample differs from the population of interest due to biases resulting from the method of selection (Stockman, 1999, p. 27).

Suppose a firm based in town wishes to estimate the price elasticity of demand for its goods. The purpose of this estimation is to help it decide on how much to price its goods when it opens a new outlet in the heartlands in a year's time. In its research, the firm varies its prices over the few months and notes the quantity of goods sold to get an estimate of the price elasticity of demand. Besides running the risk of the *ceteris paribus* condition not holding every month, the firm also faces significant selection bias in this study. This is because the group of consumers that patronise its current town outlet may be very different from those groups patronising the

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heartlands, leading to an incorrect estimation of the price elasticity of demand. For example, the firm may be estimating the behaviour of tourists with more price inelastic demand at its town outlet, when these customers are likely to be less prevalent in its outlet in the heartlands.

At the end of this section, you would better understand the typical cognitive pitfalls in the interpretation of information. Note that these examples are non-exhaustive. To extend your learning, interested students can also check out the Catalogue of Bias to learn more about other cognitive pitfalls. With these thinking skills, you would be better equipped to evaluate the relevance of information given and draw sound interpretations supported by economic concepts, theories and principles.

SDL: QR code for the link to [Catalogue of Bias](#):



FOR NOTE TAKING:

2. RATIONAL DECISION-MAKING, SHADOW PRICING AND DISCOUNTING

2.1. Introduction

In Theme 1, the decision-making approach that was learnt in H2 will be revisited, before equipping ourselves with several analytical tools to gain a deeper understanding of the complexities involved in the decision-making process of economic agents.

In Theme 1.1.1, we will revise the decision-making process from the H2 syllabus, with a focus on the rationality assumption in economic decision-making and the difficulties involved in making decisions. Some important questions that will be explored are:

- What exactly is rationality?
- Is information on costs and benefits of all economic decisions readily available?
- How do economists measure non-tangible benefits and costs?
- How do economists extend their analysis of decisions from a static to a dynamic position?
- Are these methods to measure costs and benefits debatable?

In Theme 1.2.1, we challenge the rationality assumption and explore how the concepts in Behavioural Economics could better explain why behaviours of economic agents may sometimes deviate from the prediction of standard economic models. Some of the important questions that we will be exploring for this sub-theme are:

- Are all decisions made by economic agents rational?
- What are some irrational decisions that are predictable?
- How can an understanding of Behavioural Economics, including Nudge Theory, be applied by consumers, producers and governments to influence behaviour and achieve their objectives

2.2 Rational Decision-Making

A central assumption in Economics is the assumption that economic agents behave rationally, but what exactly does this mean? A simple working definition for rational decision-making that one could use would be as follows: You try to make the best choices you can, given the information available. (McEachern, 2005, p. 11)

Although seemingly innocuous at first glance, this definition hints at the complexities in the rational decision-making process. First, notice that the definition of “try” describing how economic agents make choices; if decision-making was straightforward, why is there a need to “try” making these decisions? Second, the writer of the definition inserts that information for decision-making may not always be forthcoming.

In the next two sub-sections, we explore in greater detail, the process of rational decision-making (the weighing of marginal costs and benefits), and the outcome of rational decision-making (the maximisation of self-interest).

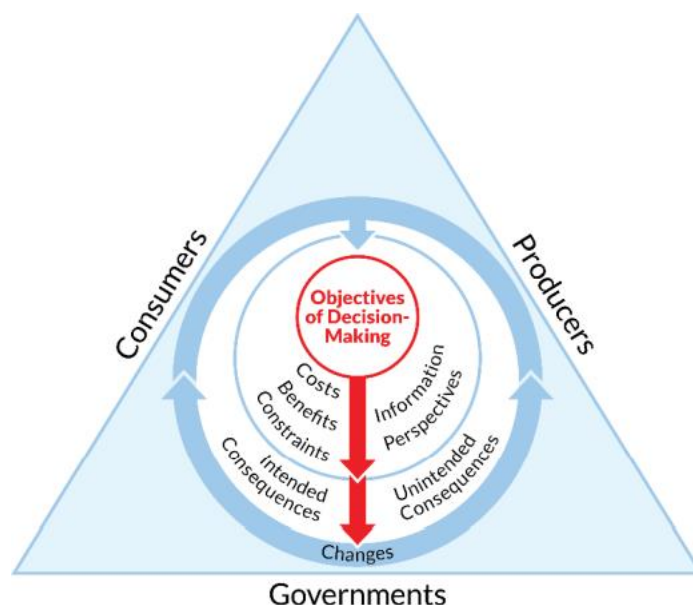
2.2.1 Maximisation of self-interest by economic agents

Rational maximisation of self-interest is a normative idea. This is because (i) what is deemed as self-interest to one agent may be very different from another, and (ii) a decision that may seem rational to one person may seem to be irrational to others. For example, some consumers may include the happiness of others such as family and friends when he or she chooses to purchase a good such as a car, while other consumers only consider their own personal comfort when making the same decision. As another example, some consumers may gain a large degree of utility from purchasing goods (e.g., canned food) for donation to charities, while others may view this to be a highly irrational choice. A deeper analysis and discussion of the Economics of giving will be presented in a later section.

2.2.2 Weighing of marginal costs and benefits

In the H2 syllabus, you would have learnt the decision-making approach (as seen in Figure B) where economic agents make their decisions by adopting the marginalist approach. For example, consumers are concerned about their marginal utility vis-à-vis their marginal costs, producers are interested in the marginal revenue and the marginal cost, and governments would consider the marginal social benefits and marginal social costs in their decisions.

FIGURE B: The Decision-Making Approach in Economics



Implicit in the above formulation of costs and benefits of economic agents are the following two assumptions:

1. Economic agents have perfect information on all types of costs and benefits.
2. Economic agents are able to predict with certainty, costs and benefits that accrue in the future.

Please refer to the lecture notes Decision-Making Approach in H2 Economics covered in JC1.

2.3 Shadow-pricing

Where price does not reflect the actual value of a good or commodity, or no market value for a good or commodity exists, *shadow pricing* can be used. Shadow pricing is a proxy value of a good, often defined by what an individual must give up gaining an extra unit of the good. The value of a good or impact resulting from a project when measured using shadow pricing may, however, differ from the value of that or similar goods or impacts when measured using market prices. This occurs due to market failure in real markets which impacts on the shadow value of certain goods and impacts.

A number of examples of this are given in the Table 3 below which has been adapted from Stiglitz (2000, 283).

Market	Difference between Market and Shadow Price	Explanation
Labour	Shadow wage is less than market wage when there is unemployment.	No loss in output elsewhere when individual gains employment, so marginal social cost of hiring this individual is lower than market wage.
Capital	Shadow interest rate is greater than market interest rate when there is rationing in capital markets.	Expected return is greater than interest rate as firms wish to borrow more at given interest rate than they can. Opportunity cost of funds is greater than interest rate.
Steel	Shadow price is greater than market price.	Steel producer does not account for marginal social cost of pollution in production costs.

Source: <https://www.cbabuilder.co.uk/Quant2>.

2.3.1 Application of Shadow Pricing

The concept of shadow-pricing is commonly used in decisions made by government bodies, where large scale projects that require a thorough cost-benefit analysis are often undertaken. The implausibility of the assumption 1 that economic agents have perfect information on all types of costs and benefits arises from two sources:

- (i) the presence of non-market items in decision-making; and
- (ii) inaccurate prices due to distortions to market prices.

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To understand both these ideas, take the example of a government considering whether to build a new hospital. Given that more lives can be saved with the new hospital, does that automatically mean the hospital **must** be built? From an economic perspective, the answer must be a definite no (and a H3 student should be able to bring in an answer that involves the use of the concept of opportunity cost at this juncture!).

In the example above, the non-market item would be the number of lives that can be saved. How does Economics go about valuing this? A common method would be to value lives in terms of the loss of output to the economy. Of course, this is a very coarse measure (does it mean that the life of a person who is unable to work has no value?). Consider other non-market goods such as clean air from reduction of pollution or the aesthetic value of developing a garden □ can a government accurately shadow-price these with full certainty?

When the government is attempting to measure the cost of constructing the physical building of the hospital, the market price quoted by the construction company may not reflect the true social cost of the construction. For example, the construction of the hospital may bring about significant negative externalities in production, thus resulting in the market price being understated from the true social cost. On the other hand, market power of the construction company may cause the market price to be overstated from the true social cost. The government thus has to adjust the cost to account for these distortions when it attempts to create a shadow-price for the construction of the hospital.

Shadow prices are thus essential to running an accurate cost-benefit analysis of a project. It estimates the economic value of goods or services not traded in a traditional market but still impacts economic decision-making.

2.3.2 Total Economic Value

The total economic value (TEV) of a resource or amenity reflects not only the value we associate with our current use of the amenity (the 'use value') but also the potential future value we consider the amenity to have, and the value we associate simply with the existence of the resource or amenity.

This can be expressed as follows:

$$\text{TEV} = \text{Use Value} + \text{Option Value} + \text{Existence Value}$$

Use Value

The Use Value is the value we consider a resource or amenity to currently have in reference to our current use of it. For example, we may value the East Coast park based on flying a kite, walking a dog around it, jogging and having picnics.

Option Value

The option value of a resource or amenity reflects the value we would give to our potential or optional future use of the resource or amenity. For example, we may consider our park would be

a good place to start surfing or organised flea markets on weekends, which would increase our overall future use of the park and therefore our value of it.

Existence Value

The existence value is the value which reflects our willingness to pay for a resource or asset to be preserved simply because we wish for it to continue to exist. In the case of our park regardless of current use value and future option value, we would also wish it to continue to exist.

“Shadow prices are prices indicating the intrinsic or true value of a factor or product in the sense of equilibrium prices. These prices may be different for different time periods as well as geographically separate areas and various occupations (in the case of labour). They may deviate from market prices.” J. Tinbergen

2.3.2 Discounting

Central to the concept of discounting is that a dollar today is worth more than a dollar tomorrow. The reason for this is that a dollar today can be invested at the prevailing interest rates today to derive more than a dollar tomorrow. For this reason, when one measures the costs or benefits that are only realised in the future, we need to discount these values to arrive at their valuations today, also known as the net present value of the cost or benefit. As an example, when a firm is deciding on whether to pay for new technology today which may result in an extra revenue of \$100,000 in two years, it has to be cognisant that tomorrow's \$100,000 is a smaller value in today's terms. How small exactly? Assume that the annual interest rate that the firm can earn from leaving the money in the bank is 2%. You can deposit about \$96,117 today and earn the 2% annual interest on your money and arrive at \$100,000 two years later (\$96,117 X 1.02 X 1.02). The present value of \$100,000 in two years is thus \$96,117. In making its decision on whether to invest in new technology today, the firm should thus consider whether today's cost of new technology is greater or less than \$96,117, rather than \$100,000.

Formula to calculate present value:

$$P = \frac{F}{(1 + r)^t}$$

P: Present value

F: Future Value

r: rate of return

t: time period

Similar to shadow-pricing, the process of discounting brings about its own set of challenges. For one, given that costs and benefits are only happening in the future, it is difficult to predict with full certainty what these costs and benefits will be. Even if the economic agent was sure about the future value of these costs and benefits, it is still difficult to compute the present value of these costs and benefits. To do so, the agent must predict the interest rate at which to discount future costs and benefits.

3. BOUNDED RATIONALITY

3.1 Introduction to Behavioural Economics

Behavioural economics is a field that combines insights from psychology and economics to understand and explain how individuals make economic decisions. It recognises that people often deviate from the assumptions of perfect rationality and self-interest in traditional economic models.

It is a relatively new field in Economics which has risen to prominence in the last decade in both academia and policy application. In 2002, Behavioural Economics rose to greater prominence when Daniel Kahneman was awarded the Nobel Prize in Economics for his ground-breaking work on this topic. This was followed by popular works such as *Nudge* (Thaler and Sunstein, 2009), *Predictably Irrational* (Ariely, 2010) and *Misbehaving* (Thaler, 2016) that cast the topic into the public limelight with many accessible examples of how Behavioural Economics can be applied to our everyday lives. This has not been lost on Singapore's policy makers with an active application of the subject to various policy decision, which have been compiled into the book *Behavioural Economics and Policy Design: Examples from Singapore* (Low, 2012).

Human behaviour may deviate from the predictions of standard economic model due to the following: bounded rationality, bounded will-power and bounded self-interest. Bounded rationality reflects the limited cognitive abilities that affects problem-solving abilities. Bounded will-power causes people to sometimes make choices that are not in their long-term interest. Bounded self-interest explains why humans are often willing to sacrifice their own interests for others' well-being. In the following sections, we will explore how decision-making by economic agents are affected by bounded rationality, bounded will-power and bounded self-interest.

The field of behavioural economics has practical applications in various domains, including finance, public policy, marketing, and consumer behaviour. By understanding the underlying psychological factors that drive decision-making, researchers and policymakers can design interventions and policies that better align with how people make choices.

In the following section, we present two areas in which the bounded rationality assumption can be called into question, namely the tendency of economic agents towards loss aversion and salience bias. Many of these concepts have been derived from carefully crafted experiments, which present the opportunity for teachers to use an inductive experimental approach in teaching these concepts in our classrooms. In H2 Economics, students have learnt about how sunk cost fallacy in their strategies or to nudge the decisions of economic agents respectively.

In H3 Economics, you will gain a deeper understanding of theoretical underpinnings of the concepts introduced in H2 Economics and broader awareness of its relevance and applications.

3.1.1 Loss Aversion

Before the landmark paper *Prospect Theory: An Analysis of Decision under Risk* which played a big role in winning Daniel Kahneman his Nobel Prize in 2002, economists commonly painted a picture of economic agents being risk-averse in all situations. As a simplified illustration, risk-aversion predicts that when faced with a sure outcome and a gamble with the same expected value, economic agents will opt for the certain outcome.

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Here's an example of an experiment that was used by Kahneman and Tversky (1979) in experiments to show this phenomenon.

Question 1: In addition to whatever you own, you have been given \$1,000. Choose one of the following two options:

- A) 50% chance of gaining another \$1,000
- B) Gaining another \$500 with 100% certainty

Question 2: In addition to whatever you own, you have been given \$2,000. Choose one of the following two options:

- A) 50% chance of losing \$1,000
- B) Losing \$500 with 100% certainty

Note that the situation in both questions is essentially the same - would you rather take the following gamble: 50% chance of getting \$2,000 vs 50% chance of getting \$1,000 (similar to option A for both questions 1 and 2) or have \$1,500 with certainty (similar to option B for both questions 1 and 2). However, it is very likely that students will replicate what Kahneman and Tversky found: Majority of the respondents chose option B for question 1 but chose option A for question 2.

Another set of questions found in Kahneman (2011) can also be used in a deductive approach for students to uncover the concept of loss aversion:

Question 3: Which of the following two options would you choose?

- A) Get \$900 for sure
- B) A 90% chance to get \$1,000

Question 4: Which of the following two options would you choose?

- A) Lose \$900 for sure
- B) A 90% chance to lose \$1,000

When the problem is framed as a gain, economic agents are more likely to be risk averse, opting for option A for question 3. Yet, when the same problem is framed as losses, a risk seeking attitude prevails, with the majority of economic agents likely to choose option B for question 4. Once again, the prospect of sure losses seems to elicit a different set of behaviours in economic agents.

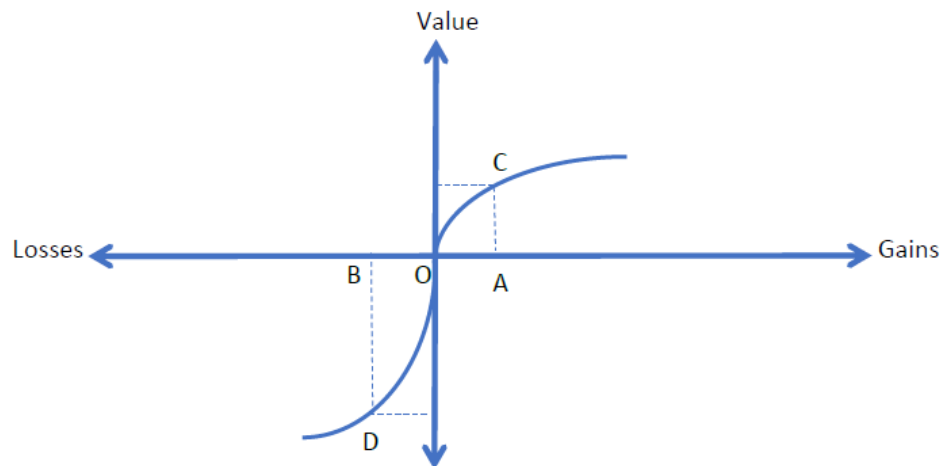
For example, refer to question 3 in the PCK Tip above. The expected value of option A is $\$900 \times 100\% = \900 while the expected value of option B is, $\$1,000 \times 90\% + \$0 \times 10\% = \$900$. Risk-aversion would predict that most economic agents will choose option A over B, which is in line with our basic intuition.

However, through a series of cleverly designed experiments, Daniel Kahneman and Amos Tversky were able to refine this assumption to highlight **that risk-aversion is more likely in events where gains are involved. When events are framed as losses, agents tend to display risk-seeking behaviour**, as opposed to risk-averse behaviour. In addition, the authors showed that the pain of losing any amount of money is much greater than the joy of gaining the same amount of money.

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To illustrate this, consider the following thought exercise. For a coin flip, you will lose \$100 if tails appear. There is an equal chance of getting heads or tails. How much must you be paid for heads to appear before you accept the risk of this coin flip? \$90? \$100? \$150? \$200? Or more? What if the cost of tails increases to \$200? If you had accepted \$200 for heads in the previous scenario where the cost of tails is \$100, will you accept \$400 for heads in this new scenario? The authors found that few people will accept a fair bet (i.e., accept \$100 for heads when faced with a loss of \$100 for tails). This is due to the pain of losing \$100 looming much larger than the joy of gaining \$100, and the larger the loss, the greater the aversion to the fair bet. This led them to come up with the following diagram in **Figure 1 and 2** to illustrate loss aversion:

Figure 1–2: Loss Aversion



As can be seen from **Figure 12** above, for the same amount of gains and losses ($OA = OB$), economic agents attribute a much larger negative value (BD) to the losses than the positive value (AC) that they attribute to the same amount of gains. Next, we explore three concepts □ endowment effect, sunk cost fallacy and status quo bias which are related to loss aversion:

Next, we explore three concepts, endowment effect, sunk cost fallacy and status quo bias which are related to loss aversion:

- (a) Endowment effect
- (b) Sunk cost fallacy
- (c) Status quo bias

A. Endowment effect

Another application of loss aversion is the endowment effect. This is defined by Thaler (1980) as the increased value of a good to an individual when the good The endowment effect focuses on the mismatch in valuation between sellers of goods that they own and buyers of such goods. Note that this effect is less pronounced when it comes to firms, whose primary objective is to sell their goods. Instead this effect would be more relevant in markets such as second-hand markets, where the goods put up for sale were previously owned by the seller.

Once again, this effect is a manifestation of loss aversion, as the seller will be viewing the sale of the good as a loss while the buyer will be viewing the purchase of the good as a gain. As a result, the minimum amount necessary for the seller to be willing to part with the good is likely to be higher than the maximum amount the buyer is willing to pay for the good.

How can this be applied to what we have learnt in H2 Economics or what we will be learning in H3 Economics? As mentioned in the previous paragraph, the disparity in valuations between sellers and buyers may result in fewer completed transactions than expected in second-hand markets. The Coase Theorem that students will be learning in Theme 2 is also called into question (Kahneman et al., 1990). This is because the initial allocation of goods will matter for the eventual allocation of the goods, which is contrary to what Coase Theorem predicts.

B. Sunk cost fallacy

Decisions should be made by considering the marginal costs and benefits involved, and any sunk costs should be ignored. Yet, economic agents often find themselves trapped by the sunk cost fallacy. The sunk cost effect is manifested in a greater tendency to continue an endeavour once an investment in money, effort, or time has been made (Arkes and Blumer, 1985).

A paper by Kahneman and Tversky (1979) cite empirical findings of the tendency for gamblers to bet on longshots (bets with a very slim probability of winning but potentially high returns) increases during the course of a racing day if a gambler has already incurred losses. In rational decision making, sunk cost, such as losses, should not affect subsequent decisions. However, due to sunk cost fallacy, economic agents are more likely to continue with the endeavour once money, time or effort has been invested. **So, how are sunk cost fallacy and loss aversion related?**

Incurred sunk cost causes economic agents to frame a decision in terms of losses which encourages risk-seeking behaviour. For example, if a gambler has already incurred a loss of \$1,000, he will need to decide to either walk away with the loss or continue betting on longshots (with a slim chance of walking home with a gain). When faced with such a decision, a loss averse economic agent would become risk-seeking and would choose to continue betting on longshots.

C. Status quo bias

One would think that when an economic agent is presented with a choice between two options, this choice would be relatively stable across time if the agent makes it under the same set of information. As it turns out, *ceteris paribus*, there is a simple way for the choice to be engineered to skew the decisions of agents by setting defaults. When an option is framed as the default option, economic agents are more likely to stick to that particular option for two reasons, as proposed by Thaler and Sunstein (2009). First, loss aversion features heavily, as the agent is primed to think about the default as the option that “belongs” to him. Therefore, even if both options are equally valuable to the economic agent, he is unlikely to opt out of the default, as the loss of the default will loom much larger than the gain of the alternative option. Second, there might just be a lack of attention on the part of the economic agents, in what Thaler and Sunstein (2009) call the *status quo bias*. As a result of this lack of attention, or unwillingness to think hard about the decision to be made, agents may simply go along with the default option, in particular if this option is prescribed by someone they trust (for example, the government that they voted for).

3.1.2 Salience Bias

Salience bias describes people's tendency to focus on items and information that are more noticeable and observable, and to ignore those that do not grab our attention. Also known as the availability heuristic, the salience bias causes economic agents to overestimate the likelihood of events that come easily to mind (Low, 2012). This bias is especially dangerous when economic agents decide on what information to pay attention to when they formulate the costs and benefits of any decision. For example, after a major air incident that has been widely covered in the media, consumers may irrationally judge the probability of deaths in air crashes to be very high, which may result in a fall in demand for short distance flights and a corresponding increase in demand for other modes of short distance travel options such as trains, buses and cars. This is despite the fact that the probability of death on the road may actually be higher than in the air! As an example, the University of Oxford calculated that in 2006, Britons had odds of one in 36,512 of dying in a motor accident and one in 3.5 million of dying in a plane crash. Hence, when economic agents are susceptible to the salience bias, the decision-making process is clouded as the weighing of benefits and costs is likely to be irrationally skewed.

Besides dramatic events that receive widespread coverage, the salience bias may occur when personal experiences, pictures and vivid examples are involved, where one is more influenced by them than statistics or the experiences of others (Kahneman, 2011, p. 130).

Salience bias is pervasive in our everyday behaviour. You will probably relate to this study conducted by Flavius Kehr (2016). Even though participants of the study expressed much privacy concerns in the online realm, it was discovered that they often simply give away their private information on the Internet once salience aspects of the websites catch their attention. This is known as the privacy paradox. To overcome this paradox, it is suggested that a pop-up message could appear on an individual's browser as a timely reminder before private information is shared.

Salient events may also act as a catalyst for government action. For example, the 11 September 2001 terrorist attacks in the US brought about a spike in military operations and government investment in security. This is corroborated by a study conducted by Wibbenmeyer, et al. (2019) which discovered evidence of salience bias affecting the government provision of public goods. For example, in communities which recently experienced wildfires, they are subsequently more likely to be recipients of government projects on managing wildfire hazards.

Salience bias can also have implication on market outcomes. House prices are likely to be lower after a nearby flood or fire, even though such effect diminishes over time as people become less aware of such events (Bin and Landry, 2013).

3.2 Prospect Theory

Prospect theory suggests that individuals may exhibit risk-seeking behaviour when faced with potential losses (loss aversion) and risk-averse behaviour when faced with potential gains. This can lead to suboptimal choices, as individuals may prioritize avoiding losses or seeking immediate gains over long-term benefits.

Prospect theory, developed by Daniel Kahneman and Amos Tversky, is a behavioural economic theory that explains how individuals make decisions when faced with uncertain outcomes. It

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suggests that people's decision-making is influenced by subjective perceptions of gains and losses, rather than objective probabilities.

Examples to illustrate how prospect theory works:

a. Example of Loss Aversion

Imagine you are given two options for a potential gain or loss. Option A: You have a 50% chance to win \$100 and a 50% chance to win nothing. Option B: You are guaranteed to win \$50. According to prospect theory, individuals tend to exhibit loss aversion, meaning they are more sensitive to potential losses than gains. In this case, many people would choose Option B, even though Option A has a higher expected value (\$50 versus \$0). The desire to avoid the potential loss of receiving nothing outweighs the potential gain of winning \$100.

b. Example of the Framing Effect

Consider a medical scenario where individuals are presented with two treatment options. Treatment A is described as having a 90% success rate, while Treatment B is described as having a 10% failure rate. Although the information is equivalent, the framing of the options influences decision-making. Prospect theory suggests that individuals are more likely to choose Treatment A because it is framed in terms of a positive outcome (success rate), rather than Treatment B, which is framed in terms of a negative outcome (failure rate). The way options are presented or framed can significantly impact people's preferences and decisions.

To conclude, these examples highlight key principles of prospect theory, such as loss aversion and the framing effect. By understanding how individuals evaluate and respond to potential gains and losses, prospect theory helps explain deviations from traditional rational decision-making models and provides insights into how people make choices under uncertainty.

4. BOUNDED WILL-POWER & BOUNDED SELF-INTEREST

4.1.1 Bounded Will-Power

In economic terms, bounded willpower can be **defined** as the finite capacity of individuals to exert self-control or resist immediate temptations to pursue long-term goals or make disciplined economic choices. It acknowledges that individuals may face limitations in their ability to consistently exercise willpower due to cognitive, emotional, and physiological factors.

From an economic perspective, bounded willpower has implications for decision-making and behavior related to savings, consumption, investment, and other economic activities. It implies that individuals may struggle to adhere to long-term financial plans or resist impulsive spending due to their limited capacity for self-control.

Bounded willpower can lead to suboptimal economic outcomes, as individuals may make choices that prioritize immediate gratification over long-term financial well-being. It highlights the importance of understanding and addressing the factors that deplete or influence willpower, as

well as designing interventions and policies that support individuals in making more disciplined economic decisions.

Bounded will-power is related to problems such as procrastination. For example, it may be in your long-term interest to start revision for your examination which is just round the corner to achieve better grades but somehow, you find it difficult to commit. Due to bounded willpower, you may continue to procrastinate and only start the night before the examination and are not able to finish revising as a result. Originally, you had more than enough time to complete your revision but your tendency to procrastinate jeopardised your chance to pull up your grades. Another example is of how dieters may behave. Before going to the restaurant, they may say that they do not want to have dessert. However, when the time comes for dessert, they change their mind and make a decision which is against their long-term interest to achieve a healthier body.

4.1.2 Findings

Gneezy and Rustichini (2000) conducted a study on bounded will-power within the framework of behavioral economics. Their research revealed that individuals often exhibit limited self-control when making decisions, particularly in the presence of immediate temptations or distractions. The study highlighted that self-control is a finite resource that can be depleted, leading to impulsive decision-making. Furthermore, the researchers found that environmental factors and situational cues significantly influence self-control and decision outcomes. The findings underscored the importance of understanding the boundaries of self-control and the impact of situational factors on decision-making within the realm of behavioral economics.

O'Donoghue and Rabin (1997) delved into the realm of behavioral economics in the context of addiction and self-control. Their study emphasized the role of time inconsistency and hyperbolic discounting in understanding addictive behavior. They found that individuals often struggle with self-control due to present bias, leading them to make choices that prioritize immediate gratification over long-term well-being, particularly in the context of addictive behaviors. The study shed light on the implications of behavioral economics for understanding and addressing addiction, emphasizing the need for interventions that consider the unique decision-making challenges associated with self-control and addictive tendencies.

4.1.2 Time inconsistent preferences and procrastination

Time inconsistent preferences and procrastination are concepts in economics that relate to the tendency of individuals to make choices that deviate from what is considered rational or optimal over time.

Time inconsistent preferences refer to situations where an individual's preferences or desires change as time passes. This means that their preferences at a present moment differ from what they would prefer in the future. For example, someone may have the intention to save money for retirement but consistently choose immediate consumption instead.

Procrastination, in an economic context, refers to the tendency to delay or postpone actions that are beneficial in the long run but require effort or sacrifice in the present. It involves choosing short-term gratification or avoiding unpleasant tasks over pursuing long-term goals. For instance, an individual may delay starting a savings plan or delay studying for an exam until the last minute.

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These phenomena have significant implications for economic decision-making and can lead to suboptimal outcomes. They can result in inadequate savings, excessive debt, under saving for retirement, and failure to pursue long-term investments.

Bernartzi and Thaler (2007) investigated the heuristic and biases in retirement saving behavior. They found that individuals often exhibit inertia when it comes to retirement savings, sticking with default options or previous choices even when it may not be in their best interest. The study also highlighted the impact of present bias, where individuals prioritize immediate rewards over long-term benefits, leading to insufficient retirement savings. Additionally, the researchers proposed the use of behavioral economics principles to design choice architecture that could help individuals make better retirement saving decisions.

Understanding time inconsistent preferences and procrastination is crucial for policymakers and economists to design interventions and policies that can help individuals overcome these behavioral tendencies. Strategies like commitment devices, pre-commitment mechanisms, and nudges can be employed to align short-term actions with long-term goals and promote more desirable economic outcomes.

By considering the influence of time inconsistency and procrastination, economists can develop a more comprehensive understanding of decision-making and design interventions that help individuals make choices that better align with their long-term well-being.

4.2.1 Bounded Self-Interest

Bounded self-interest refers to the comforting reality that humans are often willing to sacrifice their own welfare to enhance the welfare of others. Despite the COVID-19 pandemic, the National Volunteer and Philanthropy Centre (NVPC) reported that it received \$102 million in donations via their Giving.sg portal for the financial year from April 1, 2020 to March 31, 2021. This was more than 2.5 times the \$39.5 million raised in the last financial year, and it exceeded past records (Straits Times, 5 April 2021). At first glance, giving behaviour may seem to fly in the face of rationality in Economics. While the marginal cost of time, energy or money (or all three of them) is often clear, the marginal benefit of giving may be less so. Yet, data on charitable giving by the World Giving Index 2021 paints a very different picture. In 2020, more than three in 10 adults around the world donated money (source: CAFonline.org). World Giving Index presents clear evidence that giving behaviour is well and truly present in the world. This has not gone unnoticed by economists and giving behaviour has garnered significant research interest among economists.

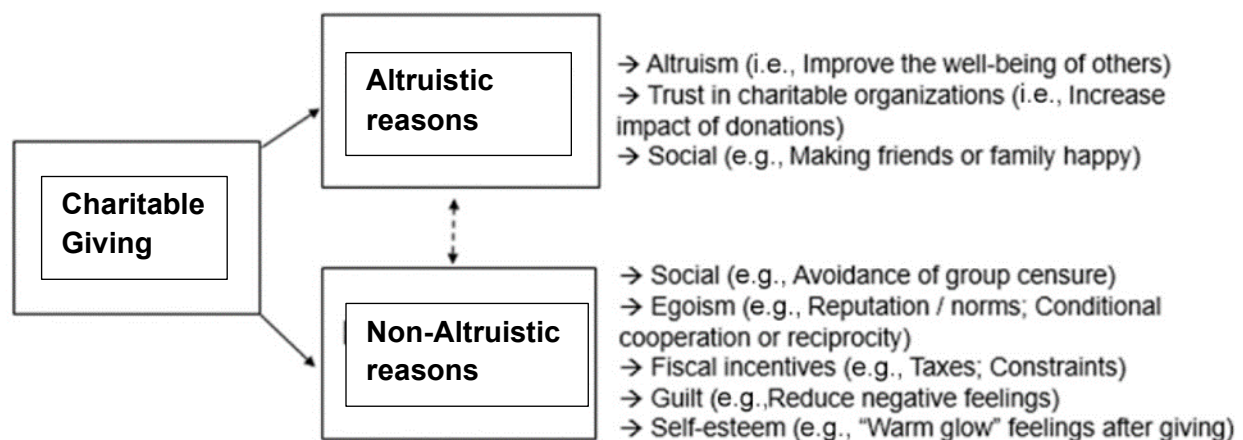
On another note, in Gneezy and Rustichini's 2000 study, they examined the impact of imposing fines on parents for late pickups at daycare centers. The researchers found that instead of reducing instances of lateness, the introduction of fines led to an increase in late pickups. This unexpected outcome was attributed to the shift in the perception of lateness: parents now viewed lateness as an acceptable behavior that could be remedied by paying a fee, rather than a behavior to be avoided.

The study shed light on the complexities of using monetary penalties as incentives and highlighted how traditional economic theories about incentives and penalties might not always align with actual human behavior. This research contributed to the field of behavioral economics by

demonstrating the potential unintended consequences of using financial incentives to influence social behaviors, challenging simplistic economic assumptions about human decision-making.

4.2.2 Giving Behaviour

Kolm and Ythier (2006) found that the marginal benefit of giving is not negligible and the reasons for giving can be broadly divided into two categories: altruistic and non-altruistic. To an economic agent, these reasons would feature in his or her utility function when an act of giving is conducted. Altruism can be defined as the preference for the good of other people in itself, and it also denotes acting in favour of this motive. Some examples of altruistic reasons for giving can be empathy, compassion, pity, sympathy or affection (Kolm and Ythier, 2006). In this aspect, giving is an end in itself, rather than a means to an end. One can think of the utility of others being accounted for in the utility of the giver when giving is altruistic. On the other hand, there can be many non-altruistic reasons for giving, whereby giving is seen as a means to an end. For example, economic agents give to elicit praise, gratitude or admiration from others. Agents may also give because they expect reciprocity from the receiver or are reciprocating giving they have received. In such cases, the utility of others is not accounted in the utility of the giver.



Source: <https://journals.sagepub.com/doi/10.1177/0899764017744894>

Kolm and Ythier (2006) proposed two contrasting ways in which giving may affect the welfare of the society. First, inequity may not be as serious if giving behaviour is pervasive. This is because people who are unable to access certain necessities via the traditional market mechanism have an alternate avenue 'in the form of charitable giving' to access these necessities.

4.2.3 Benefits of Giving

a. Promoting Equity

In economics, fairness and social norms play a crucial role in shaping individuals' preferences and behavior. Giving can contribute to a sense of fairness by reducing income inequality and ensuring a more equitable distribution of resources. For example, when individuals voluntarily contribute a portion of their income to progressive taxation systems, it helps fund social welfare programs that benefit the less fortunate and promote equity.

b. Fostering Social Mobility

Giving can help reduce intergenerational income disparities and promote social mobility. Philanthropic initiatives that focus on providing quality education, vocational training, or mentorship to underprivileged individuals can enhance their upward mobility prospects. By breaking the cycle of poverty, giving contributes to a more equitable society and improves overall welfare.

c. Enhancing Human Capital and Productivity for Economic Growth

Giving can positively impact equity by investing in human capital and promoting equal opportunities. For example, scholarships or mentoring programs funded by philanthropic efforts can enable individuals from disadvantaged backgrounds to acquire education and skills, enhancing their future earning potential. This promotes a more equitable distribution of opportunities and improves overall welfare.

d. Overcoming Market Failures

Markets may not always provide equitable outcomes due to various market failures. Giving can address these failures by providing resources or services that are not efficiently provided by the market. For instance, charitable organizations that provide access to education, healthcare, or housing for disadvantaged individuals can help alleviate the inequities arising from market failures and improve overall welfare.

e. Creating Positive Externalities

Giving can generate positive externalities that benefit society as a whole. For example, philanthropic investments in scientific research or technological advancements can have widespread benefits, leading to economic growth and improved well-being for all. These positive externalities contribute to a more equitable distribution of resources and enhance overall welfare.

However, giving behaviours, especially those motivated by non-altruistic reasons, may lead to inefficiencies in the market. Instead of using price as a signalling agent for the demand and supply of goods, non-altruistic giving behaviour such as reciprocity in collusion may prevent firms from competitively undercutting each other's selling prices or outbidding one another, even if it is in their interest to do so. Therefore, prices may be over-rigid and high, leading to lower consumer welfare.

4.2.4 Costs of Giving

Non-altruistic reasons, such as self-interest or individual preferences, can sometimes lead to inefficiencies in various contexts.

a. Externalities

When individuals or firms prioritize their own benefits without considering the costs imposed on others, it can lead to negative externalities. For instance, a factory may pollute the environment to maximize its profits, but the pollution harms the health and well-being of the surrounding

community. The costs of pollution are not accounted for by the polluting firm, resulting in an inefficient allocation of resources.

b. Market Power

In certain market situations, self-interested behavior can lead to market failures and inefficiencies. For example, in the case of monopolies, a single company may prioritize its own profits by setting high prices and restricting output, leading to reduced consumer welfare and economic inefficiency.

These examples demonstrate how non-altruistic reasons, driven by self-interest or individual preferences, can lead to inefficiencies in resource allocation. They highlight the need for mechanisms, regulations, and incentives to address these inefficiencies and promote more socially optimal outcomes.

4.2.5 Theory of Moral Sentiments

The Theory of Moral Sentiments is a philosophical work written by Adam Smith, first published in 1759. It explores the nature and origins of human morality, focusing on the role of empathy and sympathy in shaping moral judgments and behavior. In the book, Smith argues that moral judgments are not solely based on rational decision-making but are deeply influenced by our ability to empathize with others and feel sympathy for their experiences. He suggests that humans have an innate moral sense that guides our interactions and relationships.

Smith emphasizes the importance of impartial spectatorship, the idea that we imagine ourselves as an impartial observer of our own actions and the actions of others. This perspective allows us to evaluate our behavior and moral choices in light of how they would be viewed by an objective and impartial observer. According to Smith, our moral sentiments are shaped by social interactions and the approval or disapproval of others. We desire to be praised and avoid criticism, leading us to internalize societal norms and develop a sense of moral virtue.

Overall, the Theory of Moral Sentiments presents a view of morality as a social and emotional phenomenon, rooted in our capacity for empathy and sympathy. It provides insights into the moral nature of human beings and the role of social relationships in shaping our moral judgments and conduct.

4.2.6 Comparing the different schools of thoughts

Kolm and Ythier's (2006) perspective on giving and equity in welfare focuses on the economic aspects of voluntary redistribution and its positive impact on societal welfare. They emphasize the role of fairness, social norms, market failures, and investments in human capital to promote equitable outcomes. On the other hand, Adam Smith's Theory of Moral Sentiments, written in 1759, takes a philosophical and moral perspective on human morality and behavior. Smith argues that moral judgments are shaped by our capacity for empathy and sympathy, which guide our interactions and relationships. He emphasizes the role of impartial spectatorship and the desire for social approval in driving moral virtues.

While there may be some overlap in terms of the positive impact of giving on welfare and equity, the perspectives of Kolm and Ythier (2006) and Adam Smith's Theory of Moral Sentiments differ in their emphasis and approach. Kolm and Ythier provide an economic rationale for giving and redistribution, focusing on market failures, fairness, and investments. Smith, on the other hand, explores the moral and emotional foundations of human behavior, emphasizing empathy, sympathy, and the pursuit of moral virtue.

Both perspectives contribute valuable insights into understanding the role of giving in promoting welfare and equity, but they approach the topic from different angles and with different theoretical frameworks.

5. APPLICATION OF THE USE OF BOUNDED RATIONALITY, BOUNDED WILL-POWER & BOUNDED SELF-INTEREST BY ECONOMIC AGENTS

Companies often leverage loss aversion of consumers to sell their products. For example, insurance companies can sell insurance policies for highly unlikely events because of consumers' preference to avoid losses. Insurance companies would provide a list of costly, yet highly unlikely, outcomes if an individual is not insured. By tapping on salience bias, such a list would prime potential consumers to recognise the losses and want to avoid them. Loss-aversion can explain why consumers are willing to commit to insurance plans, even if the likelihood of incurring the losses is very low.

For addictive habits such as smoking, due to bounded will-power, it can be very challenging for smokers to stick to the plan to quit smoking. Giné, Karlan, & Zinman (2008) designed a savings account where smokers could voluntarily commit to depositing a certain amount each month and withdraw their savings if they successfully quit smoking in six months. Otherwise, their savings would be forfeited to charity. The application of Behavioural Economics to influence behaviours and achieve policy objectives has gained much traction amongst governments in recent years.

Thaler and Sunstein's 2008 book, *Nudge: Improving Decisions about Health, Wealth and Happiness*, popularised the application of Behavioural Economics to public policy issues. The term "nudge" refers to any aspect of choice architecture that alters people's behaviour in a predictable way without removing any options or significantly changing the financial incentives. Choice architecture is the design of how choices can be presented to elicit certain decisions. Consider the use of choice architecture where healthy food such as fruits are placed at prominent and convenient locations in the school cafeteria to encourage students to eat healthily. Another example of choice architecture is major retailers charging customers 10-cents for each plastic bag rather than giving them a 10-cent rebate for not taking one. Due to loss aversion, the thought of losing 10-cents is more painful than the satisfaction derived from gaining 10-cents, and hence charging a small fee is more effective at reducing usage of plastic bags than providing a similar rebate.

It might be difficult to differentiate a nudge from other ways of changing behaviour. The book *Evidence-based policymaking in Singapore: A policymaker's toolkit* highlights a few distinguishing features of nudge:

1. **Nudge retains the element of choice.** It simply makes it easier for people to make better choices. For example, placing healthy food at prominent and convenient locations counts as a nudge but banning junk food does not.
2. **Financial incentives can be considered nudges if they do not greatly alter the economic incentives.** If there is an alteration of economic incentives, it should be small relative to the effect of the behavioural change. For example, charging 10-cents for a plastic bag is a small financial penalty which does not significantly affect the economic incentives. This is considered a nudge. However, imposing a charge of \$10 for plastic bags is not considered a nudge.
3. **The context of the financial incentives can be considered nudges.** The UK Behavioural Insights Team designed an EAST framework to summarise how nudges can be designed to be effective, by considering the following:
 - **Easy:** simple and causing least friction
 - **Attractive:** attracting attention
 - **Social:** taking advantage of social norms and team spirit
 - **Timely:** delivered at the right time by the right person

Even though it is expected that a good's quantity demanded will fall when the price goes up, this may not be observed if the price change is small and temporary which might be unnoticed by consumers. Nudges can help make price changes more salient. For example, a thermostat designed to reflect the cost of operating it, is likely to cause a greater fall in the quantity demanded of electricity when prices go up.

4. **Nudges help people make better choices on their own.** These choices are aligned to people's intention but often they are unable to execute them on their own due to cognitive biases. For example, people may not commit to a savings plan despite being aware of the need to start saving as early as possible for long-term retirement planning. Sometimes they are simply put off by the administrative hassle. In the US, a savings plan known as the "Save More Tomorrow" plan (Thaler & Benartzi, 2004) gives workers the option of committing themselves now to increase their savings rates later. The savings rates will increase in the future and be synchronised with their pay raises. Such a savings plan is effective at getting workers to abide by their commitment. It also leverages the status quo bias to encourage workers to stick to their savings plan as it would take extra effort to cancel the plan.

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