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School of Business and Economics

Do We Insure Our Most Valuable Asset, Ourselves?

A study of students' insurance habits

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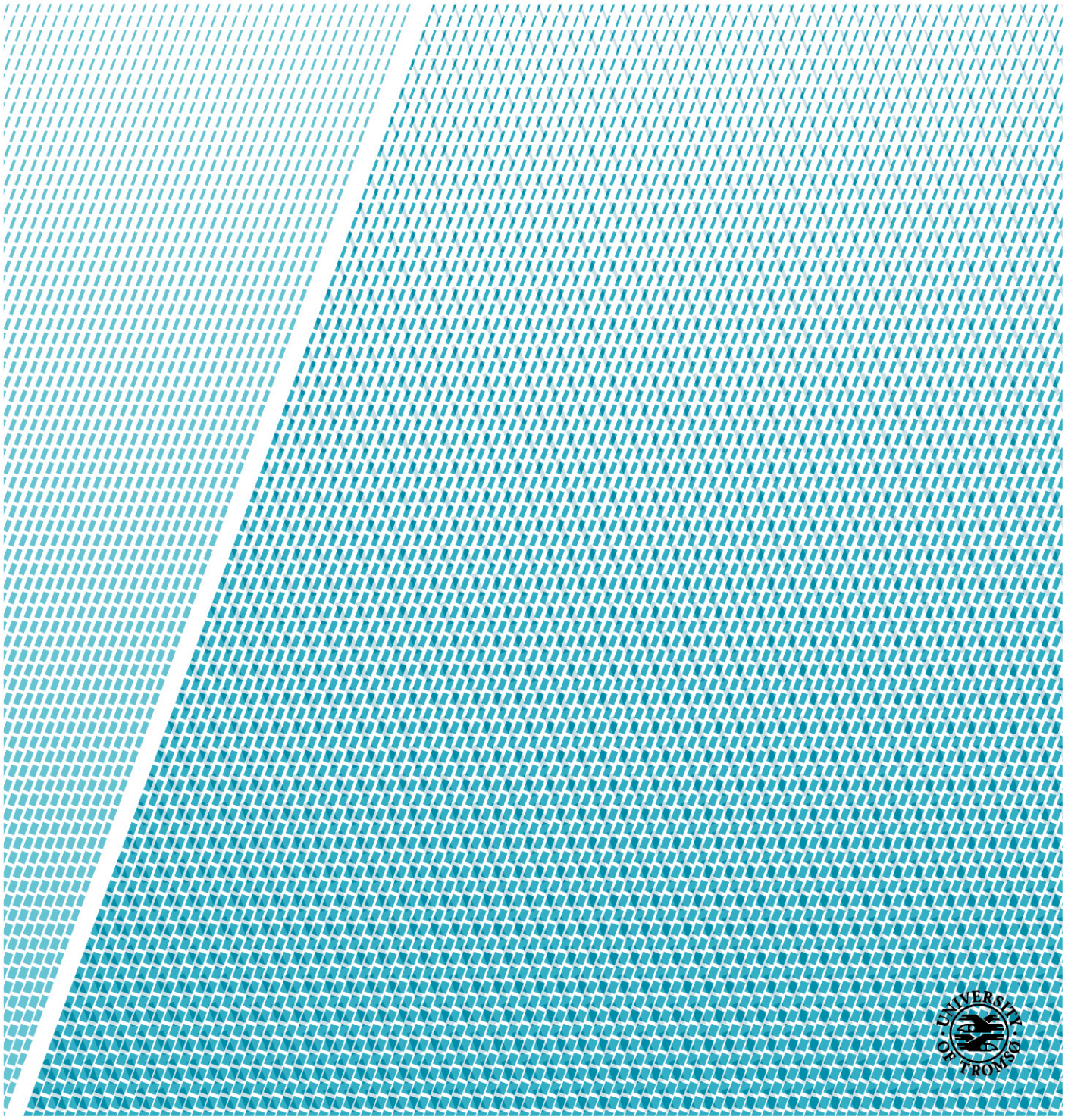
Master's Thesis in Economics – December 2017



Abstract

This thesis is taken a deeper look at risk-taking behaviour regarding insurance choices and the possible explanation for why students expose themselves to the economic risk of becoming disabled. This thesis discusses some of the reasons why anomalies occur in relation to insurance choices. The students' willingness to purchase disability insurance is investigated by the use of an econometric approach, more specifically a logistic regression. The program used to make the regressions and analysis was Rstudio. The variables, age, education, risk-preferences and the perceived probability of becoming disabled, are all found to have a statistical significant effect on the willingness to purchase disability insurance. Based on the survey I conducted, it is apparent that students have very little knowledge about disability insurance. However, the majority of students became more willing to buy insurance after receiving some fact-based information on disability and disability insurance.

Preface

This master thesis is written in the autumn of 2017, and is part of my two-year Master's degree in Economics and Administration at the The Arctic University of Norway, Campus Tromsø.

I would especially like to thank my supervisor Sverre Braathen Thyholdt and assistant supervisor Eirik Eriksen Heen for very useful feedbacks, support and assistance with programming throughout the whole process.

The writing process has been at times very demanding, but also instructive and exciting.
The acquired knowledge, especially in the use of programming tools, I believe will be a resource when entering the labour market.

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1. Introduction

Every single day we are exposed to some kind of risk. The consequences of risk can be negative as well as positive. Nevertheless, risk is usually associated with the likelihood that something with a negative consequence occurs. To secure us against unwanted incidents, we purchase insurance.

The most important asset for most individuals is the human capital. Human capital is defined as the value of all future income. For young people, human capital is especially valuable, since they have a long career ahead of them. People often think that prolonged illness is something that happens to others or when one gets older, and "accidents" is a foreign word. But unfortunately, anyone can be affected by disability. Nevertheless, there is a considerable probability that young people do not have disability insurance. Why do individuals choose to expose themselves to the risk of becoming disabled, either by illness or by an accident, when they do not have to? In this master's thesis, I will take a closer look at some of the potential mechanisms behind this risk-taking behaviour.

Heuristics, which is known as rules of thumb, are tools to help us make decisions on a daily basis. Heuristics may work perfectly in our daily life, but when people start applying heuristics when making decisions in uncertain and unpredictable situations, such as the possibility of becoming disabled, problems may arise. This is known as a heuristic trap. As humans, it comes easy for us to put our trust in heuristics, and ignore information about an impending hazard. Ignoring such risks can have very unfortunate consequences.

It turns out that many young people have contents insurance, travel insurance and mobile phone insurance. They also tend to choose the most expensive car insurance, but many do not have disability insurance. What is the reason for this?

Theory is not always in accordance with empirical data. If people behave non-rationally in a predictive way, behavioural economics can provide a powerful framework to understand why, and what the next move might be. Awareness of psychological factors can help insurance agents reach more people.

1.1 Thesis Purpose

The purpose of this paper is to increase the understanding of what lies behind young people's relationship to insurance, and their preferences linked to risk.

Based on this, the following three research questions was prepared:

$H_1 = Does\ gender\ affect\ willingness\ to\ purchase\ disability\ \ insurance?$
$H_2 = Does\ perceived\ probability\ of\ \ disability\ affect\ willingness\ to\ purchase\ insurance?$
$H_3 = Does\ risk\ preferences\ affect\ willingness\ to\ purchase\ disability\ \ insurance?$

1.2 Structure of the Paper

This thesis begins with a discussion of various factors that affect how individuals make decision under risk and uncertainty, followed by a review of literature examining decisions to insure. Then the data set is presented and analysed. Finally, the empirical results are reported and discussed, and the conclusions of this work is summarized.

2. Theoretical Background

To discuss deviation from theory, we must discuss what we mean with decision theory. This is to establish the framework for the future discussion.

2.1 Rationality and Utility

2.1.1 Rationality

People's behaviour is sometimes characterized as ”irrational”, but what does ”irrational” mean? To understand this question, we have to fully understand rational decision-making. A rational person is assumed to take account of all available information, the probability of an event occurring**,** potential costs and benefits of following their preferences, and also act consistently by choosing the best option available.

There are often unlimited ways to be irrational, but mostly only one way to be rational. As this term is understood in classical economic theory – they must hold and act on a set of consistent preferences, i.e. preferences that satisfy the axioms of rational choice (Ackert & Deaves, 2009). The axioms for rational choices are complete, transitivity, continuous and independence.

The first axiom is that people’s preferences are complete. *Complete* means that a person can compare all possible choices and evaluate a choice as a preference or indifference. This assumption is violated if a person has no opinion about which of the options he prefers, and also cannot say that the two options are equivalent to him (Hens & Bachmann, 2011).

The second axiom is *transitivity.* The axiom of transitivity is satisfactory if a person prefers A to B and B to C, then the person also must prefer A to C. If the transitivity axiom is violated, we cannot determine an optimal or best choice. This implies that rational choices are transitive.

The third axiom is *continuous*. This means in a choice of three lotteries where the individual has transitive preferences (wishing A instead of B and B rather than C), there will be a possible combination of A and C that the individual will be indifferent to compared to B.

The fourth axiom is *independence*. The preferences are independent of irrelevant alternatives that say two lotteries mixed with an irrelevant third option, the lotteries will be ranked according to the same order as if the two lotteries are placed independently of the third.

This entails that a person's decision making under risk is rational if the four axioms is satisfied.

2.1.2 Utility

Why do we buy the goods and services that we do? One reason is that they provide us with satisfaction – we feel better when we have purchased them. This satisfaction is called utility by economists.

To find the best option, a utility function is used. A utility function describes a consumer's preferences. The function assigns a level of benefits to any combination of goods included in the function. The essential is not the level, but that the function can be used to rank the goods. Rational people act to maximize their own utility, and will always prefer the option that will maximize their utility, given all possible outcomes and probabilities associated with these.

From the figure below, we see a logarithmic utility function with a concave axis from the origin, where the marginal utility is decreasing at higher value of wealth. Which means that an incremental increase in wealth gives less utility as the wealth increases. This entails that an increase in wealth from 0 to 100 NOK gives more benefits than an increase from 10,000 NOK to 10,100 NOK.

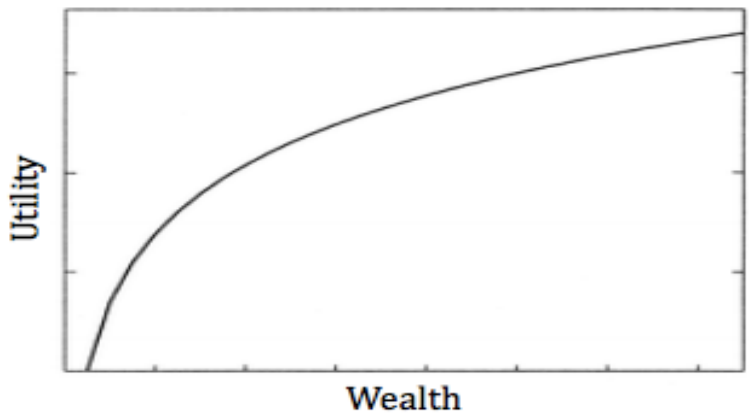

Figure 1: Diminishing marginal utility

2.2 Expected Utility Theory

Expected utility theory was developed by John von Neumann and Oskar Morgenstern in an attempt to define rational behaviour when people are exposed to risk
(Neumann & Morgenstern, 1944).

The theory indicates that a person who is in a decision situation with unknown outcomes, will evaluate the options based on two factors: probability of the respective outcome and the expected utility of this outcome. According to Briggs (2017), the theory can be derived into the following three units:

1) *Outcome*, what are possible consequences of a choice.
2) *States*, circumstances beyond the control of the decision that may affect the outcome of the decision.
3) *Actions*, actions that the agent can do to achieve or avoid an outcome.

The theory is based on the four elementary rules (axioms) of rationality, as mentioned in section 2.1.1. It is based on decision makers considering the different choices they face in terms of final wealth and choosing the outcome that gives the highest expected value. The expected utility value is calculated by multiplying the utility of an outcome with the probability that the outcome will occur.

Decision making under risk can be viewed as a choice between prospects and gambles. Prospect is defined as a series of wealth outcomes, each of which is linked with a probability (Ackert & Deaves, 2009). Expected utility is set up to handle risk, and not uncertainty. Risky situations are situations when you know what the outcome could be and can assign a probability to each possible outcome. Uncertainty applies to situations where you cannot assign probabilities or clearly define possible outcomes (Ackert & Deaves, 2009).

According to expected utility theory, the most preferred outcome does not only depend on the highest expected wealth, but also on the person's risk aversion. People are different and have different risk preferences. Some people are more willing to take risky decisions than others. Individuals' risk preferences are divided into three categories: risk aversion, risk seeking and risk neutral.

2.2.1 Risk Profiles

Risk Aversion

Risk aversion means that a person wants to avoid risk. It has been proved that most of us are risk averse and that we tend to choose safe outcomes over a fair gamble. According to Kahneman and Tversky (1979), a person is risk-averse if "*he prefers the certain prospect (x) to any risky asset with expected value x"*. This implies that a risk-averse person would not accept a fair gamble where there is equal probability of winning or losing, for example 1,000 NOK. For this person the utility of the prospect will be lower than the expected utility.

Risk Seeking

According to Ackert and Deaves (2009), people who buy scratch cards can regarded as risk-seeking. Most people lose money on scratch cards, and even if the potential winnings can be extremely high, the expected return is negative. A risk-seeking person would rather gamble on the risky outcome than choose the expected value of the prospect with certainty. This person would rather gamble on a 40% chance of winning 50,000 NOK and a 60% chance of winning 100,000 NOK, versus winning 62,000 NOK with certainty (Ackert & Deaves, 2009). Risk-seeking behaviour is widespread when people have to choose between a safe loss and a significant likelihood of a greater loss.

Risk Neutral

A risk-neutral person only cares about the expected value. To this person, the risk is irrelevant (Ackert & Deaves, 2009). When offered either $100 guaranteed or a 50% chance of winning either $200 and $0, a risk-neutral person would be indifferent.

2.2.2 Criticism of Expected Utility Theory

In recent times, expected utility theory has been met with some resistance. A documented violation of expected utility theory is the Allais paradox. Allais describes how people do not always base their choices on utility maximization, but that there are other factors that can affect the decision choice (Ackert & Deaves, 2009). Conlisk (1989) examined the Allais paradox by presenting the following problems to a number of participants:

Table 1: Allais paradox. Problem 1

A	**A***
$1,000,000 with 100% probability (EV= 1,000,000)	$0 with 1% probability $1,000,000 with 89%probability $5,000,000 with 10% probability (EV= 1,390,000)

Table 2: Allais paradox. Problem 2

B	**B***
$0 with 89% probability $1,000,000 with 11% probability (EV= 110,000)	$0 with 90% probability $5,000,000 with 10% probability (EV= 500,000)

In Problem 1, a high proportion of the subjects turned out to choose A rather than A*. In Problem 2, however, a high proportion of the subjects chose B* rather than B. Participants seem to change their preferences by first selecting the option that provides the lowest expected value, and then the option that provides the highest expected value. This breaks with the expected utility theory since this theory states that one must choose either A and B, or A* and B*.

2.3 Prospect Theory

In the wake of these violations/paradoxes, alternative theories have been developed to try to better explain how humans behave. The most famous is the prospect theory developed by Daniel Kahneman and Amos Tversky in 1979. The theory is based on experimental findings of actual behaviour. Prospect theory and expected utility differ in two important areas. Firstly, the prospect theory uses weights instead of probabilities to measure risk. Secondly, in prospect theory, the decision maker estimates gains and losses from a reference point instead of the final outcome (Kahneman & Tversky, 1979).

2.3.1 Key Aspects of Prospect Theory

1) Depending on the circumstance of a prospect, people sometimes appear as risk-averse and other times as risk-seeking. People can thus change risk preferences depending on the frame of the prospect.

2) How individuals consider a prospect depends on gains and losses according to a reference point. This reference point is often a person's starting point defined as "status quo". An example is present wealth.

3) The third aspect is loss aversion. When loss and gain are compared, losses loom larger than gains.

Below are examples of these aspects illustrated, which give an impression of how people think in different situations where they are asked to make decisions that involve risk.

Aspect 1

Table 3: Change of risk preferences (Tversky & Kahneman, 1981)

Problem 1	Problem 2
P1: A sure gain of $240 **P2**: 25% chance to gain $1000, and 75% chance to gain nothing	**P3**: A sure loss of $750 **P4:** 75% chance to lose $1000, and 25% chance to lose nothing

This is an experiment of Kahneman and Tversky from 1981. Eighty-four per cent of the subjects chose P1 in Problem 1. This is consistent with risk aversion, where a riskless prospect is preferred to a risky prospect of equal or greater expected value. In Problem 2, on the other hand, 87% choose P4. Here, the subjects become risk-seeking. When we aim to avoid a loss, we become risk seeking and take the gamble over a sure loss in the hope of paying nothing. People are willing to take an uncertain loss instead of a safe loss. By purchasing insurance, you take a safe loss. We see that the respondents change their risk preferences depending on the frame of the prospect, which is inconsistent with expected utility theory.

Aspect 2

Table 4: Consider risk from a reference point (1) (Tversky & Kahneman, 1986)

Problem (i)*:*

Given that you are $300 richer than you are today, and get the following two choices:

P5: Safe gain of $100	**P6:** 50% probability of a win of $200, and 50% of winning 0

Table 5: Consider risk from a reference point (2) (Tversky & Kahneman, 1986)

Problem (ii)*:*

Given that you are $500 richer than you are today, and get the following two choices:

P7: Safe loss of $100	**P8:** 50% probability of losing 0, and 50% probability of losing $200

These two problems are effectively the same. In both cases, the choice is between having $400 with certainty and the prospect of a 50% chance of getting $500 and a 50% chance of getting $300. In Tversky and Kahneman (1986), it turned out that 72% of respondents chose

P5 and 64% of respondents chose P8. This implies risk aversion for the decision in problem (i), but risk seeking for the decision in problem (ii). Thus, one can see that the risk attitude is not the same for gains and losses when starting from a reference point. This entails that it is the change in wealth, and not the level of wealth that matters to the subjects.

Aspect 3

When perceived benefit by giving away an object is higher than the positive benefit of acquiring the object, loss aversion exists. It has been proven through extensive studies that the relationship between small and moderate losses and gains is about 2:1, indicating that a loss feels twice as negative as a gain feels positive. These estimates come both from risky choice (Tversky and Kahneman 1992) and from riskless choice (Kahneman, Knetsch, & Thaler, 1990).

An example of loss aversion is from an experiment from Tversky and Kahneman (1992), where participants were asked, “For which value of x will you be indifferent to the following options”:

Table 6: Loss aversion (Tversky & Kahneman, 1992)

Alternative 1:	**Alternative 2:**
No change in current wealth ("Status quo")	50% probability of a win X, and 50% probability of a loss of $25

The average answer in the experiment was X=$61. This implies that for a loss of $25 to be considered a fair gamble, i.e. for a person to be indifferent between accepting or rejecting the lottery, he or she requires a potential gain of $61.

It has also been shown that gains and losses appear to be experienced in nominal dollars (Thaler & Benartzi, 2004). In a study in perceptions of fairness by Tversky and Kahneman (1986), participants were asked to judge the fairness of two outcomes in pay cuts and pay increases of a company. One outcome suggested a 7% salary cut in a community with no inflation, while the other suggested a 5% pay increase in a community with 12% inflation.
The outcomes of these two situations are in fact identical in real dollar value. The effect of loss aversion in this experiment caused 68% of the participants to judge the first action as

unfair, while only 22% judged the second scenario as unfair. This is an example of money illusion – where people get confused by the difference between nominal and real dollars.

2.3.2 The Value Function

The value function displays the preference of a prospect for an individual. It indicates how an individual prefers gains and losses to a relative reference point. The reference point usually refers to an initial value, like the purchase price of an asset.

The theory identifies that an individual reacts differently when facing gains than losses. Below we have the S-shaped value function, which is concave with regard to gains and convex with regard to losses. Individuals becomes risk-averse when there is a high probability for gains and risk-seeking if there is a high probability for losses (Kahneman & Tversky, 1979).

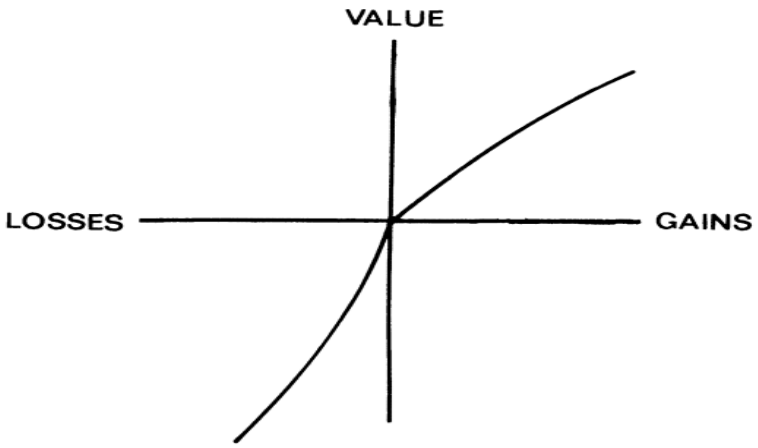

Figure 2: A hypothetical value function (Kahneman & Tversky, 1979)

Figure 2 is a lot steeper on the loss side than the gain side, this indicates that it hurts more to lose than to gain. We also see from Figure 2, at the reference point, the function is the steepest.

When a person receives salary from work, he or she will feel disutility when giving up some of that money in order to pay for insurance. As assumed in Aspect 3, the weight between losses and wins are 2:1. Giving up 100 dollars to insurance would therefore require an extra 200 dollars of salary for the utility to be equal. Since money spent on insurance cannot be

used for consumption in the present time, it may feel like a loss. This phenomenon is strongly associated with how individuals discount values, which will be reviewed later, in section 2.5.2.

2.4 Framing Effects

A decision frame refers to a decision maker's view of the problem and possible outcomes. A change in how a problem is produced can lead people to change their decisions. How people make a decision therefore depends on how the problem is presented, and this important for understanding how people make financial decisions (Ackert & Deaves, 2009). Tversky and Kahneman (1981) presented an example of how a problem can be posed in two different ways:

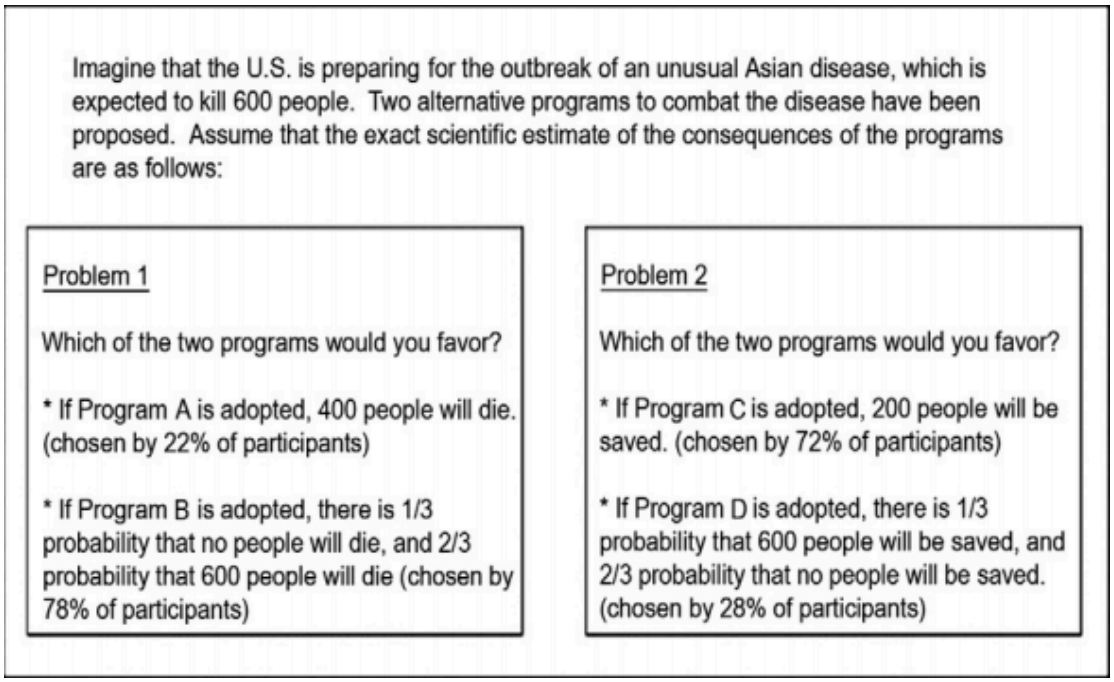

Figure 3: Framing effects. Present to humans (Lakshminarayanan, Chen, & Santos, 2011)

The aim of this experiment was to compare these two different problems and how the students perceived them. We can agree that Program A and Program C actually are the same, and Program B and Program D are also the same. As stated in both problems, 600 people are expected to die. If A is adopted, then 400 people will die and 200 will be saved. C is similar to A, only that C focuses on the fact that people will be saved while A focuses on that people will die. In the same way B and D are actually two sides of the same story**.** We should expect that the respondents would prefer either A and C or B and D. However, when the problem is presented as a loss ("people will die"), 78% prefer the risky alternative. On the other hand, when the problem is presented as gain ("people will be saved") only 28% preferred the risky alternative. Decision makers have a tendency to reject the safe and accept the chance game when both outcomes are negative. This example from Tversky and Kahneman (1981) shows

that the frame of a prospect plays a crucial role in decision making and how financial decisions are made.

Another example of the framing effect is from Kahneman and Tversky (1984). In this experiment, the respondents were faced with the following two questions:

Table 7: Framing effects with losses and cost (Kahneman & Tversky, 1984)

Alternative 1:	**Alternative 2:**
Would you accept a gamble that offers a 10% chance to win $95 and a 90% chance to lose $5?	Would you pay $5 to participate in a lottery that offers a 10% chance to win $100, and a 90% chance to win nothing?

In this experiment, 132 students responded to the two questions. 55 of the respondents expressed different preferences between the two alternatives. Among them, 42 rejected the gamble in alternative 1, but accepted the equivalent lottery in alternative 2. In fact, these two scenarios are completely identical. In both cases, you lose either $5 with 90% probability or you win $ 95 with 10% probability. One of the conclusions Kahneman and Tversky (1984) arrived at with these scenarios, was that the loss produces stronger negative feelings than costs. Could it be that buying disability insurance feels like a loss, not a cost?

2.5 Heuristics and Biases

2.5.1 Procrastination

Procrastination means that people tend to postpone unpleasant or tough decisions that demand effort (Thaler & Benartzi, 2004). Almost all people procrastinate, but this postponing can be very costly in some cases.

The basic idea is that people value the near future more than the far future. It is easier to postpone something until tomorrow rather than doing something today. People also behave based on present desire rather than future consequences. Procrastination can play a role when it comes to saving money and making financial decision. For example, 68% of 401(k) (a retirement saving plan in the United States) participants stated that they saved too little**,** among these did 35% express a desire to increase their rates of saving. Nevertheless, 86% of these individuals made no change to their saving plans in the following four months (Thaler & Benartzi, 2004).

You have the opportunity to buy disability insurance every day, so you are in the position that you can postpone the purchase of insurance indefinitely. It is possible that more people would buy disability insurance if they only once had the opportunity to buy or not buy insurance.

2.5.2 Discount Over Time

How individuals discount the value of their decisions based on time is a crucial factor in understanding why many young people postpone the purchase of disability insurance. Hyperbolic discounting is a time-inconsistent model of discounting, where people discount the value of later reward by a factor that increases with the length of the delay. Exponential discounting, on the other hand, is a time-consistent model of discounting.

Laibson (1997) proves that the discount factor is relatively high for decisions that have a short-time horizon and relatively low for those with a long-time horizon. The closer one outcome is, the higher the alternative outcome is discounted. A discount rate is the alternative rate of other asset allocations. Hyperbolic individuals procrastinate because they (wrongly) believe that future decisions will not be as important as present ones (Thaler & Benartzi, 2004). Hyperbolic discounting implies that opportunities to purchase insurance in the future

will be considered more attractive than opportunity in the present. The hyperbolic discount rate compared against other discount functions is well illustrated by the figure below.

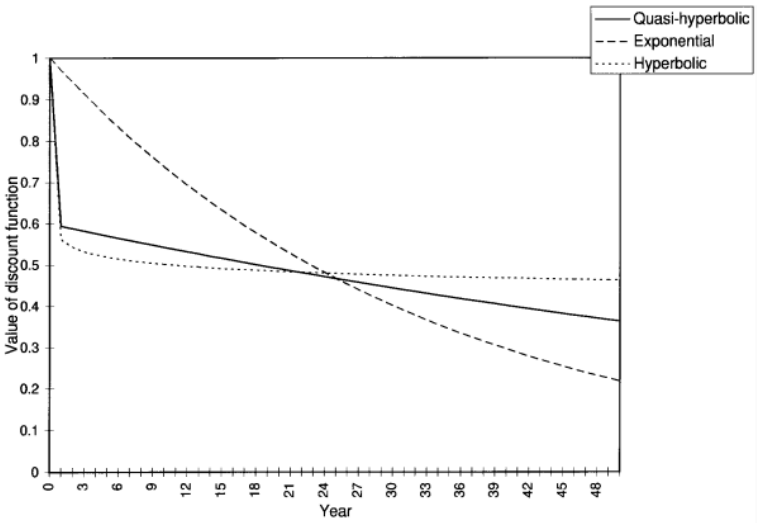

Figure 4: Hyperbolic discounting (Laibson, 1997)

As we see from the figure, the hyperbolic line falls relatively rapidly for earlier delay periods (for instance, from now to one month), but fall more slowly for longer delay periods. This is in contrast with exponential discounting, in which valuation falls by a constant factor per unit delay and the discount rate stays the same. The hyperbolic line values the present time largely compared to future time, and differs marginally between 10 and 15 years. A frequently used version of the generalized hyperbolic discount function is the quasi-hyperbolic discount factor. Quasi-hyperbolic discounting is employed as it retains much of the analytical tractability of exponential discounting, and, as the figure clearly shows, it still manages to capture the essence of hyperbolic discounting.

2.5.3 Status Quo

The status quo effect means that subjects do not want to deviate from their current state. The disadvantages of a change feel larger than the advantages, and the decision maker will be biased in favour of retaining the status quo.

Status quo bias is a combination of procrastination and loss aversion. It is a preference for the current state of affairs. The current state is taken as a reference point, and any change from this current state is perceived as a loss. Difficult decisions are exposed at the same time as the general desire to remain in the current situation, which reinforces the effect of avoiding the purchase of disability insurance. The effect of status quo bias predicts that those who already have disability insurance will continue to have it, while those who do not have disability insurance will continue to not have it.

An example of the status quo bias is from the TV game show "Let's Make a Deal". The participant could choose from one of three doors. The main prize – a car – was hidden behind one of the doors. Goats were hidden behind the other two doors. The game was played as follows: First the participant chose a door, but this door was not immediately opened. Then the host, who knew what was behind the doors, opened one of the other doors, which had a goat behind it. Then the participant was given the opportunity to change his or her original choice to the remaining unopened door. Should the participant switch doors?

The action with the highest expected payoff here is to switch. This game caused a lot of debate, even among mathematicians. Most participants decided not to switch, because they thought that the odds of winning the car had increased from 1/3 to 1/2, because the show host has opened a door with a goat behind it. In this case, the strategy to stay with your choice is only a winning strategy if the car is actually behind the door you chose, which is possible in 1 of 3 cases. On the other hand, if the participant chooses to switch to the other closed door, he or she wins the car if it is actually behind door 2 and also if its behind door 3. This game is also solved by applying Bayes' rule.

In situations where there is uncertainty about what the dominant strategy is, other factors will play a crucial role. In this case, the status quo effect will have a big impact. Think about the situation where you switch your choice and lose or you do not switch and loses. In fact, the

actual outcome is exactly the same. Anyway, most people will choose not to switch, because if you switch and lose it will feels like a bigger loss than not switching and losing.
This can explain why many participants choose not to change, even though the likelihood of winning is lower.

2.5.4 Availability and Representativeness

According to Tversky and Kahneman (1973), people tend to evaluate the frequency of classes or the probability of events by *availability,* which means the ease with which relevant instances come to mind. When people face a difficult task of judging probability or frequency, they use heuristics to reduce these decisions to simpler ones. One example of heuristics is *representativeness*. People expect a series of random events to be representative of a random process, even when the sequence is short. In the assessment of coin tosses for example, people consider the series HTTHTH more likely than the series HHHHTH or HHHTTT, although all three sequences are equally likely. The reason for this is that the last two sequences do not look random, and the series does not represent the fairness of the coin (Tversky & Kahneman, 1973).

2.5.5 Excessive Optimism and Overconfidence

As the word suggests, people tend to be way too optimistic. We do not expect to be affected by accidents, and we will typically indicate high probabilities for outcomes that are "favoured" even if historical data or earlier analyses suggest lower probabilities (Ackert & Deaves, 2009). Examples of such very positive or negative events are winning a lottery or dying of cancer.

Overconfidence is a tendency of people overestimating their knowledge, abilities, and the precision of their information. Overconfidence is also when a person is overly optimistic of the future and their ability to control it (Ackert & Deaves, 2009). According to Kahneman (2011), professors at Duke University conducted a survey where the chief financial officers (CFO) of large corporations estimated the returns of the S&P index the following year. They received 11 600 answers, and the conclusion was that the CFOs had no clue about the stock market in the short-term. The correlation between their estimates and the actual value of the S&P was less than zero.

In addition to guessing the development of the S&P index, the participants gave two other estimates: a value that they were 90% sure would be too high, and one that they were 90% sure would be too low. The range between the two values is called an "80% confidence interval", and outcomes that fall outside the interval are labelled "surprises". People who guess the confidence intervals a number of times expect about 20% of the outcomes to be surprises. In this experiment there were 67% surprises, more than three times higher than expected. This implies that CFOs were strongly overconfident about their ability to forecast the market.

Another form of overconfidence is where someone overestimates their own abilities compared to the abilities of other people. Svenson (1981) surveyed 161 students in Sweden and the United States, asking questions about the students' driving skills and how safely they think they drive compared to other people. In regards to driving skills, 93% of the U.S. sample and 69% of the Swedish sample placed themselves in the top 50%. When asked if they thought that they were safer than the median driver, 88% of the U.S. students and 77% of the Swedish students believed that they were. Optimistic drivers justify their optimism by saying, " It hasn't happened to me" (Camerer & Kunreuther, 1989).

3. Related Research

The insurance market and insurance issues are little discussed outside the industry itself, but some research has examined insuring low probability events that carry potentially very large losses. This can largely be compared to the decision of purchasing disability insurance.

Several of the similar studies are experiments. One challenge with experiments is that it is very difficult to recreate risk of major loss in the real world in an experiment. However, it is possible to determine whether insurance behaviour at relatively low probabilities differs from insurance behaviour at relatively high probabilities.

3.1 Low-Probability High-Loss Events

Conventional theory suggests that the actuarially fair value of insurance is the monetary loss from an event multiplied with the associated probability that the event will occur. Nevertheless, this is not always the way individuals value insurance. McClelland, Schulze, and Coursey (1993) examine people's expressed willingness to pay for insurance against various losses. According to Elliott (1998) most people do not understand how to value insurance. They do not understand how to value risk.

The article of McClelland et al. (1993) looks at two experiments that investigate insurance behaviour in both low-probability and high-probability situations. The experiments were conducted with real money and in several rounds. In the first experiment, the subjects could purchase insurance to prevent a fixed loss of $4 at probabilities ranging from 0.01 to 0.90. In the second experiment, the subjects could purchase insurance to prevent a fixed loss of $40 with a probability of 0.01. McClelland et al. (1993) observed that subjects tend to bid expected value when the dollar loss was moderate and the probability of the loss was greater than 10%. Contrarily, as the probability of a loss fell below 10% and the magnitude of the loss increased, subject's behaviour could no longer be described by expected value theory. When the probability of the loss fell below 10% people tended to change the focus from a probability-weighted valuation of protection to either focusing exclusively on the loss or the probability that the loss will occur. McClelland et al. (1993) revealed a consistent bi-modal distribution of bids for insurance when losses occur with low probability. One mode occurred at zero, where subjects seemed to be completely discounting the chance that the negative outcome would occur. They choose to self-insure and completely dismiss the negative

outcome. This implies that these respondents viewed the probability of a loss as sufficiently small that they were not interested in protecting themselves against it. The other mode was the bids well above the expected value. It is assumed that people making these bids were focusing on the magnitude of the loss almost exclusively.

Tversky and Kahneman (1992) noted that the probability weighting function is not well-behaved near zero. While probability weighting allows for overweighting of small probabilities, very small probabilities appear to be either "rounded down" to zero or greatly overweighed. Studies of the demand for insurance, both in the laboratory and in the field, suggest a pattern consistent with ignoring very low probability events. Individuals who demand insurance for small losses do not demand insurance for larger, less frequent losses. One explanation for this behaviour is that people only pay attention to risks when the likelihood of occurrence rises above some probability threshold (Kunreuther & Pauly, 2004) (Slovic, Fischhoff, Lichtenstein, Corrigan, & Combs, 1977).

The most well-known laboratory study of decisions regarding insurance purchasing was conducted by (Slovic et al., 1977). This was an experiment in which subjects filled out a questionnaire that elicited their willingness to purchase actuarially fair insurance in up to eight different situations. The probability of a loss was presented in terms of draws of orange and white balls from an urn, and a loss occurred only when an orange ball was drawn. The probability and size of the loss were systematically varied across questions, holding constant the expected value of the loss and the (actuarially fair) premium.

For example, one scenario had 9,999 white balls and 1 orange ball, and the loss was 10,000 points if an orange ball was drawn. In another scenario, subjects were told that there were 9,000 white balls and 1,000 orange balls, and the loss was 10 points if an orange ball was drawn. In each of the scenarios subjects were asked whether they would purchase insurance at price of one point. Slovic et al. (1977) observed that the percentage of subjects purchasing insurance was relatively low (less than 10%) when the probability of a loss was very low (and therefore the loss-amount high), and systematically increased as the probability of a loss increased.

The conventional wisdom is that people misperceive probabilities and fail to distinguish between low-probability events and those with zero probability. This conventional wisdom

and prior experimental evidence predicts that subjects would purchase less insurance with a loss probability of 1% than with a loss probability of 10%.

3.2 Underlying Factors for Insurance Choices

People do not consider buying insurance often, and especially not those who have available explicit loss probabilities. According to Camerer and Kunreuther (1989); Huber, Wider, and Huber (1997), loss probability often does not seem to play a crucial role in people's decisions. When loss probability is considered, it is in many cases derived from experience, not from actuarial tables. Hertwig, Barron, Weber, and Erev (2004) showed that when the probabilities are based on experience, instead of statistical information, people tend to underweight low probabilities in risky situations, except when there has been a very recent occurrence of the event.

According to Slovic et al. (1977), people view insurance as an investment. This means that they like to receive some money back for their premium. They suggest that this is because insuring against high-probability, low-loss gives people a good chance of getting a monetary return (reimbursement of a loss). Purchasing insurance against hazards that do not occur seems like a waste of money. Similar to Slovic et al. (1977), Brown, Kling, Mullainathan, and Wrobel (2008) found evidence that individuals tend to view insurance as an investment and simply evaluate the expected gains and/or losses associated when deciding whether to buy a policy.

Kunreuther et al. (1978) did a field survey where they conducted face-to-face interviews with 2,055 homeowners living in flood-prone areas of the United States, and 1,006 homeowners in 18 earthquake-prone areas of California. They discovered that approximately half of the subjects were insured against flood or earthquake. The analysis of the data revealed that a significant number of homeowners in flood- and earthquake-prone areas either knew nothing about the availability and terms of the insurance, or had inaccurate information. The survey also showed that many citizens had little idea about the likelihood or potential damage of a future disaster. They concluded that the primary reason for failure in the disaster insurance market was because of the lack of consumer interest.

In some cases, a disadvantage can be framed either as a cost or as a loss. An example of this is from Slovic, Fischhoff, and Lichtenstein (1982). In the first question, the respondents were

given the opportunity to choose between a sure loss of $50 or a 25% chance of losing $200. Slovic et al. (1982) reported that 80% of their subjects expressed a risk-seeking preference for the gamble over the sure loss. In question 2, only 35% of the subjects refused to pay $50 for an insurance against a 25% risk of losing $200. The difference between the questions was that the first question was framed as an uncompensated loss, but framed as the cost of protection in the second. This implies that the preferences for loss was reversed in the two problems since people dislike losses more than they dislike costs (Kahneman & Tversky, 1984).

Kunreuther and Slovic (1978) noticed that "the availability effect" helps explain the purchase of insurance and preventive behaviour after disasters. Those who get hit or avoid being hit by a disaster are often very worried. When a significant earthquake hits California the citizens are diligent for a while at purchasing insurance, and adopting measures of protection and mitigation in case of natural disasters. They seal their basement doors against floods and buy emergency supplies. However, with time the memories of the disaster decreases, and so do worries and diligence.

A previous study by Kunreuther, Novemsky, and Kahneman (2001) discovered that individuals do not appear to be able to distinguish between different values of probability when all values are "low". For example, when asked to estimate the safety of a hypothetical chemical facility, people did not differ between probabilities of 1 in 100,000 to 1 in 10 million.

It has been widely accepted that individuals tend to under-insure against low-probability, high-loss events relative to high-probability, low-loss events. When people fail to insure against catastrophic losses, the social and economic cost of this can be quite high (Elliott, 1998). To my knowledge there have been few attempts at investigating young people's insurance preferences, especially health insurance. The contribution of my thesis to the existing literature consist of a more comprehensive picture of young people's risk preferences. In addition, the thesis covers how young people actually act in connection with insurance and not just hypothetical questions about probability and possible losses. Previous research has studied events such as earthquakes, floods, fires and hurricanes, but not health insurance. These are events that greatly affect a person's life, but not necessarily future income, as disability does.

4. Methodology

4.1 Data Collection

In this study, I conducted a survey, to find the reasons why students do or do not purchase disability insurance. The survey was initially conducted on 102 students in two different lectures at the The Arctic University of Norway, Campus Tromsø. Data from the remaining 28 respondents was obtained with help of social media. Since the focus in this thesis was at those aged 18–30, the final sample was reduced by 4 students.

I first asked a pilot group of 10 people to check if any questions were unclear, and also if the answers were about what I predicted. Based on their feedback, some small changes were made to the survey. The 10 respondents from the pilot group are not part of the actual study.

To prevent respondents from not completing the survey, I kept my survey as short as possible. If the survey is too long, there is a risk that the respondent will be bored, and this may affect the reliability of the answers.

4.2 Survey Design

The survey was designed in Google Docs, which is a free, online software solution for designing surveys. Designing the survey online in Google Docs was favourable for several reasons; it was timesaving, easy to collect data, and there were also advantages to analysing the results.

The survey was given with defined alternatives, a standardization which makes it possible to compare answers between individuals. However, there was a box in questions 13 and 14 where the respondents could write in their own words. To get the most reliable results, the survey was conducted in Norwegian, the native language of the respondents, as this helps avoid language misunderstandings.

The purpose of Question 1 was to see if the students have a desire to insure something of high value. The point of this hypothetical question is that this machine is actually the students themselves, where 500,000 NOK approximately reflects their yearly income in the future. If they are initially positive to insure the machine, they should also be positive to insure themselves. Question 1 is based on Elliott (1998), which claims that people do not understand

how to value insurance. The theory related to this question is the "framing effect", where the context of the question being asked could have a major impact on how students respond.

The objective of Question 2 and Question 15 was to test how people treat probabilities and examine whether this could best be explained by expected utility or prospect theory. Expected utility suggests that the subjects will have the same risk aversion for gains and losses, while prospect theory suggests that individuals are risk-averse with respect to gains, but risk-seeking with respect to losses. These two questions are both based on an experiment by Kahneman and Tversky (1979). The questions are quite similar, but the difference is in whether the participant is in the winning or losing domain.

The questions regarding which types of insurance the students actually have are asked to illustrate what the students define as valuable and not valuable to them. In addition, the students must take into account the probability that something will be damaged. These insurance questions are all related to Section 3, where previous research shows that people tend to underinsure against low-probability, high-loss events relative to high-probability, low-loss events. The insurance questions are also based on the Slovic et al. (1977) study, where people tend to look at insurance as an investment.

Question 7 was asked to test the students' knowledge or possibly lack of knowledge regarding how much they think a student will receive in support from the Norwegian government if they were to become disabled.

Question 8 is based on Tversky and Kahneman (1973), where choices are affected by the ease with which relevant instances come to mind. The purpose of this question was to test the "availability effect"– is the decision impacted by whether or not the student has any disabled family members?

Question 10 was asked to obtain the respondent's ability to estimate probabilities. If the respondent thinks it is a high probability for an incident to occur, the respondent may be more likely to buy insurance. The literature related to this question is from the field study of Kunreuther et al. (1978), whose survey revealed that many citizens had little idea about the likelihood of a future disaster. In addition, the question is based on Kunreuther et al. (2001), which claimed that people fail to distinguish between small probabilities.

Questions 9 and 11 should be seen as interconnected. The purpose of these questions was to investigate whether the students' reluctance to buy disability insurance is due to delay (procrastination) or because they wish to remain in the current situation (status quo). These two questions are quite similar, but formulated differently. This is where the framing effect comes into the picture.

Question 12 is asked to see whether the students actually have disability insurance.

To investigate the underlying reasons why the students are not insured, Question 14 was asked. The question is based on several different theories or previous researches, such as:

Alternative A: "overconfidence", relates to overconfidence compared to other people. These individuals believe that it can happen to someone else, but not one self.

Alternative B: "procrastination".

Alternative C: "hyperbolic discount". The respondent's values consumption today more than the cost of disability insurance or the possibility of becoming disabled in the future.

Alternative D: lack of consumer interest or lack of knowledge. This can be related to what Kunreuther et al. (1978) discovered in their study. They revealed that a significant number of homeowners in flood- and earthquake-prone areas either knew nothing about the availability and terms of the insurance, or had inaccurate information.

Demographic information such as age and gender was obtained, in addition to educational background. By grouping the respondents according to the information provided in this section, one could see if these factors have an impact on the behaviour. One can also use these answers to compare students with bachelor's and master's degree. Gender is relevant because, according to Eckel and Grossman (2008), in most studies women are found to be more risk-averse than men. Evidence from their abstract gamble experiments suggests greater risk aversion by women, but evidence from their experiments with a contextual environment is less conclusive.

The last question is asked to see if factual information about disability and disability insurance leads to more incentives to buy disability insurance. The facts in this question are obtained from NAV and DNB. Incentives to purchase disability insurance do not say so much alone, but they can tell us about the students' ignorance of this insurance, and this lack of knowledge is a contributing factor to the students not having this insurance.

The design of the survey is included in the Appendix 1, and the results from the survey are found in Appendix 2.

4.3 Participants

The participants of the survey mainly comprised of bachelor's and master's degree students in economics, aged 18–29 years. Even though the population is not fully representative, are some of the arguments that it was easier to collect data from these students, in addition, the two questions regarding lotteries require a certain understanding of decisions under risk. Although the participants only consist of economics students, the survey provides a good indicator of the students' behaviour associated with risk and uncertainty.

5 Empirical Findings

In this section, the results from the survey will first be presented, and then a probability model of the willingness to purchase disability insurance will be presented and estimated. The results will be discussed and concluded in Section 6.

5.1 Probability Weighting for Gains and Losses

Questions 2 and 15

The lottery in Question 2 was set up such that the expected value from the lottery exceeded the safe gain when there was potential for gain. Similarly, the lottery in Question 15 was set up such that the expected loss from choosing the lottery was higher than the certain loss.

In Figure 5 below, we see that the clear majority (80%) chose the certain outcome over the lottery, even though the expected value in the lottery was higher (4,000 NOK).

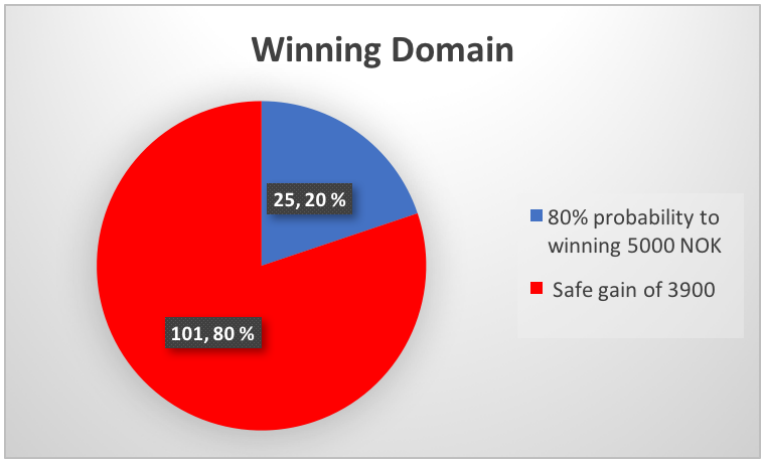

Figure 5: Probability weighting – sure gain

In Figure 6 below, we see that the risk attitude changed when choosing the lottery could avoid a loss. 63% prefer the gamble outcome to the certain loss. This is in accordance with the findings of Kahneman and Tversky (1979), that most people become risk-averse in situations of gain and risk-seeking in loss domains.

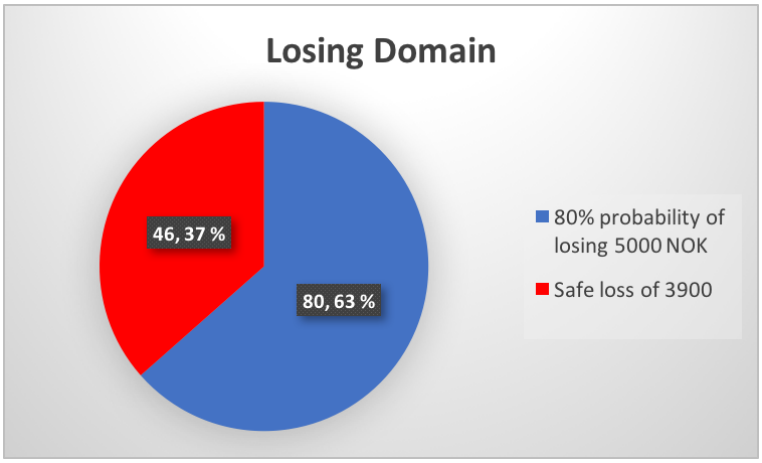

Figure 6: Probability weighting – sure loss

For this study, it is interesting to see how people change risk attitude or not. This is shown in Table 8 below.

Table 8: Preference reversal

Type of risk profile	Risk Seeking (AA)	Rational (AB)	Prospect (BA)	Risk Averse (BB)
Number of respondents (126)	11 (8.7%)	14 (11.1%)	69 (54.8%)	32 (25.4%)

AA is a person who chose "80% probability of winning 5,000 NOK" in Question 2 and "80% probability of losing 5,000 NOK" in Question 15. These respondents are defined as risk-seeking. In this case, there was a relatively low proportion that was risk-seeking in both domains, implying that most people do not like risk.

AB indicates a person who chose "80% probability of winning 5,000 NOK" in Question 2, but the safe loss of 3900 NOK in question 15. 11.1% of the respondents have preferences as predicted by expected utility theory (AB). According to expected utility theory, these people are rational. A rational person will according to expected utility choose the value with the highest expected value or the value of the lowest expected loss.

BA is a person who chose "safe gain of 3,900 NOK" in Question 2 and "80% probability of losing 5,000 NOK" in Question 15. From the table above, one can see that 54.8% of the respondents make choices in accordance with prospect theory (BA). 54.8% of the respondents change risk preferences, as they prefer the safe outcome to the lottery in Question 2, but they chose the chance to break even in the loss domain over the certain loss.

BB is a person who chose both "safe gain of 3,900 NOK" and "safe loss of 3,900 NOK". These individuals are defined as risk-averse. In the present study, 25.4% of the respondents are risk-averse, meaning they want to avoid risk and choose the safe option in both domains. As mentioned in Section in section 2.2.1 Risk Profiles, most of us are risk-averse. This was the case in the gain domain, but not in the loss domain. However, there is a significant proportion (1/4) that are risk-averse in both cases.

5.2 What the Students Want to Insure

Questions 1 and 12

In accordance with my assumptions, almost all of the respondents (95.2%) wanted to insure the machine. Unlike the machine, only 10 (8.05%) of 124 (two did not answer) respondents have disability insurance on their own. 10 respondents stated that they have insurance through their parents. On the other hand, 46% responded that they do not have disability insurance, and 37.9% that they do not know whether they have disability insurance or not. It is noteworthy that the students will initially insure an object of high value, but do not want to insure themselves. What is the difference between this machine and yourself?

Questions 3-6

In the question regarding mobile phone insurance, 27 (21.4%) out of 126 respondents stated that they have insurance on their mobile phone. Of these 27, 21 students had mobile insurance, but did not have disability insurance.

Table 9: Contents and travel insurance

Types of insurance	Contents	Travel	Both	Neither	Do not know
Number of respondents (126)	5 (4%)	24 (19%)	78 (61.9%)	9 (7.1%)	10 (8%)

As we can see from Table 9 above, 15.1% responded that they do not have travel /contents insurance or answered, “do not know”. This implies that almost nine out of ten students have either contents insurance, travel insurance or both. Another discovery was that 12 students had mobile phone insurance, contents insurance and travel insurance, but did not have disability insurance.

As we can see from Appendix 2, Table 17, there were not any extraordinary replies, except the six students who had the most expensive vehicle insurance, and paid less than 100,000 NOK for their car. Among these six, three replied that they did not have disability insurance. These three students are willing to pay up to 1,000 NOK per month for the most expensive car insurance, but are not willing to pay 150 NOK per month in disability insurance.

5.3 Heuristics and Biases

Question 7

An explanatory factor for students not having disability insurance can be due to the belief in public health and social security systems. From Table 10 below, we see that the clear majority believes that the support from the Norwegian government would be 150,000 NOK or 250,000 NOK annually.

Table 10: What the students believe they will receive in support if becoming disabled

Amounts in NOK	Respondents (percentage)
150,000	60 (47.6%)
250,000	47 (37.3%)
350,000	17 (13.5%)
400,000	2 (1.6%)

Question 7 may be biased, since it was given with defined alternatives. This may have led the students to choose a lower amount than they really had thought. It is also possible that the student focused more on choosing the correct answer (150,000 NOK) rather than give a response that reflected what they actually believe.

It is logical to assume that the more a person thinks he or she will receive in support from the Norwegian government if they become disabled, the less they would be willing to buy disability insurance. This analysis is done in Section 5.4

Question 8

Table 11: Disability in the family

Any Disabled in the family	Respondents (percentage)
Yes	31 (24.6%)
No	95 (75.4%)

As we see from the Table 11, 31 respondents stated that they have a disabled family member. However, only two of these 31 stated that they have disability insurance through their parents. Twelve answered "don't know" and 17 stated that they do not have disability insurance. None of these 31 students responded that they bought disability insurance on their own. This implies that the availability effect has remarkably little impact on the students' willingness to purchase disability insurance.

I tried to include Question 8 in the model, but it turned out that it did not have any impact on whether the students want to purchase disability insurance or not.

Questions 9 and 11

Table 12: The students' willingness to purchase disability insurance

Question 9: If you only today (i.e. now or never) had the opportunity to purchase disability insurance of 150 NOK per month, would you purchase it:

Yes	No
66 (52.4%)	60 (47.6%)

As we see from Table 12 above, just above half of the respondents stated that they would want the insurance. Compared to the 16.1% who actually have disability insurance (either through their parents or on their own), there is a large proportion that wants to buy disability insurance, but has not done it yet. This may indicate that procrastination has an impact on choices associated with health insurance. This question is my dependent variable in my model, which will be described further later in this thesis.

In Question 11, eight out of ten responded that they would not terminate the insurance, while two out of ten answered that they would have terminated it. It could be that if you first have the insurance, you will continue to have it. However, it may seem like the respondents interpreted the question as a general insurance question, and not directly linked to disability

insurance, since there is such a big difference between the results from Questions 9 and 11. Nevertheless, it is noteworthy that such a large proportion of respondents are willing to pay 150 NOK per month for an unspecified insurance.

Question 10

According to NAV (2017), 1.8% of the population aged 18–29 years are disabled. It is very difficult to distinguish between those who have become disabled during this period and those who have been disabled from before this age interval. Nevertheless, it is interesting to examine what the students believe the probability is of becoming disabled. If everyone had responded less than 1%, it would be understandable why most students do not have disability insurance, as they think that less than one out of 100 will be affected.

Table 13: Probability of being 100% disabled in the age range 18–29

Probability of being 100 % disabled	Number of respondents (percentage)
<1 %	12 (9.5%)
1-3%	43 (34.1%)
3-5%	45 (35.7%)
5-10%	19 (15.1%)
>10 %	7 (5.6%)

From Table 13, we can see that the majority thinks that the probability is between 1% and 5%. It is interesting that out of the seven who believe the probability is above 10%, only two have disability insurance.

Question 14

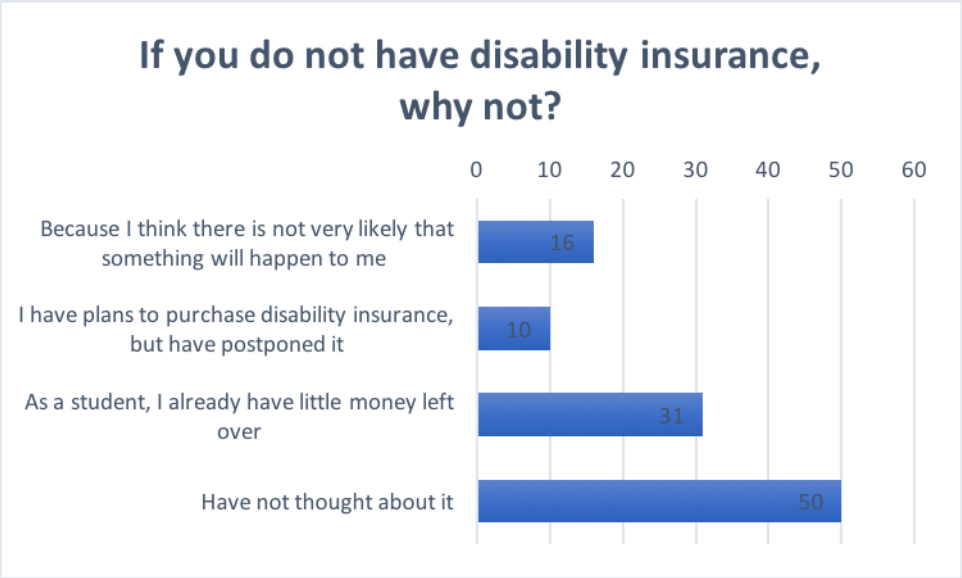

Figure 7: The reasons why the student does not have disability insurance

In this open question, there were 89 respondents and 107 answers. As mentioned earlier, students could choose one or more alternatives, and it was also possible to answer the question in their own words. It turned out that 87 of 89 chose one or more of the alternatives given, while two respondents stated that they have an injury that prevents them from getting disability insurance. As we see from Figure 7, "have not thought about it" clearly had the most votes with 46.7%. While "As a student, I already have little money left over" received about one third votes. This indicates that the students do not understand, or ignore, the need for this particular insurance.

5.4 The Model

To answer the research questions, a model has been prepared. The model is based on the survey as well as the three hypotheses mentioned in the introduction.

To analyse students' willingness to purchase disability insurance, the following model is estimated:

$$DI_i = \Lambda(\beta_1(age) + \beta_2(gender) + \beta_3(master) + \beta_4(AA) + \beta_5(AB) + \beta_6(BB) + \beta_7(q10a1p) + \beta_8(q7ab) + e_i) \quad (1)$$

The various measures are described below. $\beta_1 - \beta_8$ are parameters to be estimated, and e_i is zero-mean residual of respondent *i*.

The model in this study is a statistical model of binary, "either-or", choices. Such choices can be represented by a binary (indicator) variable that takes the value 1 if one outcome is chosen and the value 0 otherwise (Hill, Griffiths, & Lim, 2008). Based on this information, a logit model was used to analyse the data. Logit regression is a model for estimating the probability that an event occurs or not.

$$Prob(Y = 1|x) = F(x, \beta)$$
$$Prob(Y = 0|x) = 1 - F(x, \beta) \quad (2)$$

The set of β reflects the impact of changes in x on the probability. For example, among the factors that might interest us is the marginal effect of age on the probability of purchasing disability insurance. The notation Λ(.) is used to indicate the logistic cumulative distribution function.

$$Prob(Y = 1|x) = \frac{e^{x`\beta}}{1+e^{x`\beta}} = \Lambda(x`\beta) \quad (3)$$

Marginal effect indicates the change in probability by looking at a one-unit change in x on the probability that y=1. Marginal effects are computed differently for discrete (i.e. categorical) and continuous variables. The marginal effect for categorical variables shows how P(Y=1) changes as the categorical variable changes from 0 to 1, and holding the continuous variables at their means (Greene, 2008). For categorical variables with more than two possible values,

the marginal effects reveal the difference in the predicted probabilities for cases in one category relative to the reference category or base level. The (age) variable is a continuous variable, in contrast to all the other variables which are dummy variables.

5.4.1 Description of Variables

The dependent variable DI_i is the Question 9 from the survey "If you ONLY today (i.e. now or never) had the opportunity to purchase disability insurance of 150 NOK per month, would you purchase it?".

$$DI_i = \begin{cases} 1 & if\ the\ person\ want\ to\ purchase\ disability\ insurance \\ 0 & if\ the\ person\ do\ not\ want\ to\ purchase\ disability\ insurance \end{cases}$$

The variable (age) is the ages of the respondents. The $(gender)$ variable is the gender of the respondents, where male respondents are given the value 1 and female respondents are given the value 0.

The $(master)$ variable is whether or not the respondent is a master's student, which is given the value 1 if the respondent is a master's student and 0 if the respondent is a bachelor's student.

The respondents who chose the lotteries in Questions 2 and 15, and showed a risk-seeking behaviour (AA), was assigned the value 1 in the variable AA. If not they were assigned the value 0. If the respondent answered rationally according to expected utility and chose the highest expected value for gain and the value of the lowest expected loss (AB), the person was assigned with the value 1 in the variable AB. If not they were assigned the value 0. If a respondent was risk averse in both the loss and gain domain (BB), the person was assigned the value 1 in the variable BB, and 0 if not. AA, AB and BB compares with BA, which is the reference category in the model.

The variable $(q10a1p)$ is related to Question 10 in the survey: "*What do you think the probability of becoming disabled is in the age bracket 18–29?",* where q10a1p are the alternatives above 1%, B (1–3%), C (3–5%), D (3–5%), and E (more than 10%). The dichotomous variable set equal to 1 if the respondent answered that they believe the

probability of becoming disabled in the age bracket 18–29 is above 1%, and 0 if they answered less than 1%.

The variable $(q7ab)$ is the respondents who believed the support from the Norwegian government if becoming disabled is 150,000 NOK or 250,000 NOK on a yearly basis.
q7ab has the value 1 if the respondent answered 150,000 NOK or 250,000, and 0 if the respondents answered 350,000 or 400,000.

The results from the regression are listed in the Tables 14 and 15 below. The statistic program R studio-1.1.383, as well as the R packages dplyr from (Francois, 2015) and mfx from (Fernihough, 2014) were used to analyse the data.

5.4.2 Hypothesis Testing

The explanatory variables are divided into three groups:
1) The gender variable is based on H_1, and β_2 is predicted to be negative.
2) The perceived probability of becoming disabled (variable q10a1p) is based on H_2, and β_7 is predicted to be positive.
3) Risk preferences of the respondents (variables *AA, AB* and BB) are based on H_3.

To explain the data further, the p-values, the sign of the coefficients, as well as the marginal effect of the respective variables, will be explained in detail.

5.4.3 Interpretation of Variables

Table 14: Coefficients in the model

Coefficients	Estimates	Standard error	P-value
β_0(intercept)	-6.8708	2.4215	0.0046***
β_1(age)	0.1971	0.0875	0.0243**
β_2(gender)	-0.0197	0.4041	0.9612
β_3(master)	-1.2146	0.5691	0.0328**
β_4(AA)	0.8855	0.7595	0.2436
β_5 (AB)	1.1834	0.7166	0.0987*
β_6 (BB)	0.1695	0.4643	0.7151
β_7**(**q10a1p**)**	1.9379	0.8528	0.0231**
β_8(q7ab)	0.9480	0.5804	0.1024

***, **, and *, indicate significance level of 1 %, 5 %, 10 % respectively

In Table 14, we see the estimated coefficients from equation 1. As we see from Table 14, the estimated coefficient to the variable age is statistically significant with a p-value of 0.0243. The positive sign entails that the higher the age, the higher the likelihood that a person will want to purchase disability insurance.

The estimated coefficient to the gender variable is not statistically significant, with a p-value of 0.9612. This is implying that the gender variable has no impact on whether or not the respondents want to purchase disability insurance.

The master's students are not willing to purchase disability insurance, because of the negative sign on the estimated coefficient to the master variable. The master variable is statistically significant with a p-value of 0.0328.

The estimated coefficients to the variables AA and BB are not statistically significant, which means that one cannot predict whether a risk-seeking (AA), or a risk-averse (BB) person want to purchase disability insurance or not. On the other hand, the AB variable is statistically significant with a p-value of 0.0987. The estimated coefficient is positive with 1.18338, indicating that an AB person is willing to buy insurance for 150 NOK a month.

The estimated coefficient to the variable q10a1p (those who believe the probability of becoming disabled is above 1%) has a p-value of 0.0231. The positive sign, implying that these respondents are willing to buy insurance for 150 NOK a month. In addition, the

estimated coefficient to the variable q7ab is almost statistically significant with a p-value of 0.10239. This implies that many of the respondents who think that the support will either be 150,000 NOK or 250,000 NOK are willing to purchase disability insurance.

There are no signs of multicollinearity: AB and BB correlate most with a correlation coefficient of 0.21.

Below are the marginal effects of the various variables shown and explained in detail.

Table 15: Average marginal effects in the model

Coefficients	**df/dx**	**Standard error**	**P-value**
β_1(age)	0.0492	0.0218	0.0243**
β_2(gender)	-0.0049	0.1008	0.9612
β_4(master)	-0.2905	0.1232	0.0184**
β_5(AA)	0.2075	0.1593	0.1928
β_6(AB)	0.2686	0.1372	0.0503*
β_7(BB)	0.0422	0.1151	0.7140
β_8(q10a1p)	0.4086	0.1230	0.0009***
β_9(q7ab)	0.2294	0.1302	0.0782*

***, **, and *, indicate significance level of 1 %, 5 %, 10 % respectively

Table 15 shows the average marginal effect of equation (1). From Table 15, we can see that the average marginal effect of the age variable is 4.9%. This indicates that on average, if your age increases by one year, there is a 4.9% higher probability of purchasing insurance.

A slightly surprising result is the marginal effect to the master's variable. A master's student compared to a bachelor's student has 29% lower likelihood of buying disability insurance, with a p-value of 0.0184. In other words, bachelor's students are more willing to purchase disability insurance than master's students.

The marginal effect to the variable AB is 26.86%, and is statistically significant with a p-value of 0.0503. This indicates that an AB person is 26.86% more likely to buy insurance than the other risk profiles.

Those who believe there is more than 1% probability of becoming disabled in the age bracket 18–29, has 40% greater probability of purchasing disability insurance compared to those who believe there is less than 1% probability.

Those who believe the support from the Norwegian government is 150,000 NOK or 250,000 NOK have 22.94% percent higher likelihood of buying disability insurance compared to those who believe the support is 350,000 NOK or 400,000 NOK.

6 Discussion and Conclusion

6.1 Discussion

Now that the results are presented, we can address some of the reasons why anomalies occur in relation to insurance choices. First, the results from the model will be discussed, followed by the most interesting results from the survey.

6.1.1 The Model

Hypothesis 1:

$H_1 = Does\ gender\ affect\ willingness\ to\ purchase\ disability\ \ insurance?$

Hypothesis 1 was not rejected. This indicates that the gender variable did not affect the willingness to purchase disability insurance. Although previous research has mixed results, there are some studies claiming that men are more risk-seeking than women (Eckel & Grossman, 2008). Based on this, one would assume that women to a greater extent than men would be willing to pay 150 NOK per month for disability insurance. However, 32 out of 58 (55%) women and 34 of 68 (50%) men wanted to purchase disability insurance in Question 9. Additionally, it was 12 men who actually had disability insurance, while only 8 women had disability insurance (either on their own, or through their parents). In other words, in contrast to previous research, the gender variable had no impact on whether or not the respondents had disability insurance nor whether they wanted to purchase it.

Hypothesis 2

$H_2 = Does\ perceived\ probability\ of\ \ disability\ affect\ willingness\ to\ purchase\ insurance?$

Hypothesis 2 was rejected, indicating that perceived probability is affecting willingness to purchase insurance. This was not a very surprising result. Nevertheless, the fact that the students had 40% higher probability of buying disability insurance if they thought that the probability of becoming disabled is more than 1% compared to less than 1%, is quite a big difference. This may indicate that one of the reasons why some students do not want this insurance is that they round down the likelihood to zero, and think that it is totally unlikely that disability will happen to them.

Hypothesis 3

$H_3 = Does\ risk\ preferences\ affect\ willingness\ to\ purchase\ disability\ insurance?$

Those who base their choices on the highest expected value in situations of gain and lowest expected value in situations of loss, want to purchase disability insurance. The fact that a rational actor wants to buy disability insurance is consistent with expected utility theory. A rational person is assumed to take account of all available information, the probability of an event occurring**,** potential costs and benefits of following their preferences, and also act consistently by choosing the best option of an action**.**

Table 8 in Section 5.1 shows that only 14 out of 126 students who responded rationally according to expected utility theory. This may indicate that one of the reasons why so few want or have disability insurance is that most people are acting irrationally and are influenced by other factors. An example of this irrational behaviour is the risk we accept versus the risk we do not accept. We usually have no trouble driving a car or crossing the road, but many of us are afraid of flying, even though the probability of having an accident while driving a car is much higher than an accident while being a passenger on a plane.

The other variables that are not part of the hypotheses

The fact that age is a factor that affects the willingness to buy disability insurance may not be that strange. Most people become more mature with age, and are often less willing to take chances when they become older. This is comparable to that most people aged 30 are seen as slower drivers than those aged 18–20.

A priori, one would assume that a master's student is more likely to purchase a disability insurance than a bachelor's student. The better the economic understanding, the better understanding of risk and how to deal with risk. However, this was not the case in my model.

As expected, the variable q7ab had an impact on the willingness to buy insurance – the more the students think they will receive in support from the government, the less willing they are to buy disability insurance. The summary of the model indicates that basically, those who are best informed and act rationally are willing to purchase disability insurance. This is not a very revolutionary or controversial result, rather a bit as expected.

6.1.2 The Survey

The question regarding the hypothetical machine can be seen in connection with Figure 3 in section 2.4. Whether the problem was directed at the number of lives saved or the number of lives lost had a major impact on what the subjects chose. Similar to the experiment in Section 2.4, how an insurance question is presented (framing effect) plays a crucial role in whether people want to buy insurance or not. In Question 1, the human capital is presented as a machine that produces 500,000 NOK per year. It is therefore essential for an insurance agent to place disability insurance in context so young people understand the importance of this insurance. For an insurance company, without understanding how people perceive and handle risks, it is very difficult to know what sort of personal insurance program would be most effective. The companies must take into account how psychological, economic and other circumstances affect the students' behaviour. They must therefore communicate the risk to consumers by inducing concern for the hazards.

The results of which insurances the students actually have are in accordance with previous research. Previous research discovered that people tend to insure low-value items that have a relatively high likelihood of being damaged. Thus, individuals tend to purchase less insurance if the loss probability is 1% than if it is 10%. That one out of ten has a broken screen on their mobile phone is probably not that far from the truth. For 20% of the respondents, a possible return in form of a repaired phone or a new phone exceeds the cost of the insurance.

As mentioned in Section 5.2, twelve students had mobile insurance, contents insurance and travel insurance, but did not have disability insurance. This is four more than those who actually have disability insurance on their own. Could it be that the respondents think that they are sufficiently covered with travel and contents insurance? Do they think that they are insured against all possible incidents and simply has a wrong picture of reality?

Why has it become commonplace that you should have contents and travel insurance, but there is little or no focus on disability insurance? As mentioned in Section 2.3.2, loss feels twice as bad as gain feels positive. Since the students most likely will not get seriously ill or injured (disabled) during their study period, money spent on disability insurance will therefore feel like a waste of money. It may therefore seem like disability insurance is seen exclusively as loss of money and not as a cost which benefits in terms of financial security. In other words, it may seem that people misunderstand the purpose of insurance, which is

primarily to reduce economic risk, not necessarily get a return on the investment (the amount paid for the insurance).

What can be the reason for the big difference between the 10 respondents who has their own disability insurance, and the 66 who would want to buy it, if they only had one opportunity? There are several different explanatory variables for this result. The fact that we have not been forced to take an active choice could be a factor. When you purchase a new mobile phone, you are usually asked if you want to insure your device. You are forced to make a choice on the spot about whether you want insurance or not. Risk-seeking behaviour in the loss domain seems to be another important reason for the students' reluctance to purchase disability insurance. Out of the 80 respondents who chose the risky alternative in the loss domain question, 40 of these did not want disability insurance in Question 9. In other words, these 40 wants to break even in their "health lottery" by not paying anything for insurance, as well as staying healthy (avoid becoming disabled). The status quo effect could be another reason. Just like optimistic drivers justify their optimism by saying "it hasn't happened to me", it could be that the students have the illusion that, "since I have not needed disability insurance before, I will probably not need it in the future either".

The fact that about half of the students have not thought about why they do not have disability insurance, is perhaps the most important factor in the reluctance to purchase disability insurance. This is not something that young people actively think about–they must therefore be told about the risk and the consequences this risk may cause. After being informed and aware of the risks and possible consequences, they can choose whether they want disability insurance or not. By comparing the results from Question 9 and Question 19, we can see if the respondents changed their preferences to disability insurance after receiving factual information. Among the 60 respondents who did not want disability insurance in Question 9, 43 are positive to either a medium or a strong degree after receiving the information. This implies that the students' lack of knowledge regarding disability insurance seems to be another important explanation of why there are so few students who have this specific insurance.

6.2 Conclusion

The objective of this thesis has been to investigate student risk and insurance preferences. There are some important takeaways from the empirical results. In this thesis, I have found evidence to support the literature on behavioural economics in matters that are related to probability weighting. This thesis has proved that non-rational economic behaviour affects individuals' choices when it comes to insurance. We observe that the students in general have a wish to purchase disability insurance, but are in need of help to achieve this. It has been proved that loss aversion and procrastination play central roles in why students fail. Since people are loss-averse, it is preferable to spend money on consumption rather than insure us against unfortunate events. When people admit that they want to purchase disability insurance, is the solution to do it later since it demands effort, creating a state of status quo where individuals stay at their current position. All of these are biases that play a role in our decision making and has a function in describing why the respondents fail. Insurance agents need to use them to their advantage. Knowing why people fail makes it easier to account for these errors when creating insurance offers.

Further research within the field of health insurance is required. In order to establish support for my findings, I think it would be interesting to do face-to-face interviews to dig deeper into young people's risk preferences. This may be hard to do with a large number of individuals, but it is a very interesting avenue to be explored. It would also be interesting to compare willingness to buy disability insurance in Norway, against economics students in other countries, to see if geography has any impact on willingness to buy disability insurance

7 References

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8 Appendix 1

1) If you had a machine in the basement that produced 500,000 NOK a year, would you insure it?

a) Yes
b) No

2) *Do you prefer A) a lottery which has 80% probability of winning 5,000 NOK and 20% probability of winning 0 NOK, or B) a safe gain of 3900 NOK?*
   a) 80% probability of winning 5000 NOK
   b) safe gain of 3900 NOK

3) *The last time you bought a mobile phone, did you purchase insurance for it? (Includes Swap)*
   a) Yes
   b) No
   c) Do not know

4) *Do you have contents insurance and/or travel insurance?*
   a) Only contents insurance
   b) Only travel insurance
   c) Both
   d) Neither
   e) Do not know

5) *Do you own a car? If yes, do you have "limited own damage coverage" or "comprehensive motor insurance" on this car?*
   a) No, I do not own a car
   b) I only have motor vehicle liability insurance (which is mandatory)
   c) I have limited own damage cover
   d) I have comprehensive motor insurance

6) *What was the purchase price of your car? If you do not have a car, please proceed to the next question.*

a) Above 100,000 NOK
b) Below 100,000 NOK

7) *How much do you think you will receive from the Norwegian government ("Folketrygden") if you were to become 100% disabled while still being a student?*
   a) 150,000 NOK
   b) 250,000 NOK
   c) 350,000 NOK
   d) 400,000 NOK

8) *Is anyone in your family disabled?*
   a) Yes
   b) No

9) *If you ONLY today (i.e. now or never) had the opportunity to buy disability insurance of 150 NOK per month, would you buy it?*
   a) Yes
   b) No

10) *What do you think the probability of becoming disabled is in the age bracket 18–29?*
   a) Less than 1%
   b) 1–3%
   c) 3–5%
   d) 5–10%
   e) More than 10%

11) *If you had disability insurance that cost 150 NOK per month, would you terminate it?*
   a) Yes
   b) No

12) *Do you have disability insurance?*
   a) Yes, I have signed disability insurance myself
   b) I have insurance through my parents

c) Do not know
d) Do not have disability insurance (go to Question 14)

13) Why do you have disability insurance?

a) Because the loss of income if becoming disabled will have huge consequences.
b) Because for young people, disability insurance is cheap. It costs no more than 500–2,000 NOK per year, depending on the coverage.
c) Because I have a family member who is disabled and therefore feel an increased risk of becoming disabled.
d) Because students are not protected by the Working Environment Act, and I do not want to risk ending up with minimum pension.

14) If you do not have disability insurance, why not?

a) Because I do not think it is very likely that something will happen to me.
b) I have plans to buy disability insurance, but I have postponed it.
c) As a student, I do not have the money to spare.
d) I have not thought about it.

15) Do you prefer A) a lottery which has 80% probability of losing 5,000 NOK and 20% probability of losing 0 NOK, or B) a safe loss of 3,900 NOK?

a) 80% probability of losing 5,000 NOK
b) safe loss of 3,900 NOK

16) Education

a) Master's student
b) Bachelor's student

17) Age

18) Gender

a) Male
b) Female

Did you know?

- The chance of getting disabled due to an accident is negligible compared to getting disabled to illness.
- The younger you are, the more important the purchase of disability insurance is for you. This is because the National Insurance benefits ("Folketryden") are based on the number of years you have worked and your salary.
- In a worst case scenario, accident or illness at a young age can make you eligible for only the minimum pension (150,000 NOK a year).
- If you become disabled, you will receive between 33% and 66% of your previous salary in disability benefits from the National Insurance ("Folketygden").
- There are 321,837 disabled individuals in Norway in 2017.
- Of these, 14,958 are between 18 and 29 years old.

19) Given this information, is it now more likely that you will buy disability insurance?

a) Strong
b) Medium
c) Weak

9 Appendix 2

Table 16: Survey responses

	A	B	C	D	E
Question 1	120 (95.2%)	6 (4.8%)			
Question 2	25 (19.8%)	101 (80.2%)			
Question 3	27 (21.4%)	92 (73%)	7 (5.6%)		
Question 4	5 (4%)	24 (19%)	78 (61.9%)	9 (7.1%)	10 (8%)
Question 5	76 (60.3%)	12 (9.5%)	18 (14.3%)	20 (15.9%)	
Question 6	20 (39.2%)	31 (60.8%)			
Question 7	60 (47.6%)	47 (37.3%)	17 (13.5%)	2 (1.6%)	
Question 8	31 (24.6%)	95 (75.4%)			
Question 9	66 (52.4%)	60 (47.6%)			
Question 10	12 (9.5%)	43 (34.1%)	45 (35.7%)	19 (15.1%)	7 (5.6%)
Question 11	28 (22.2%)	98 (77.8%)			
Question 12	10 (8.05%)	10 (8.05%)	47 (37.9%)	57 (46%)	
Question 13	22 (61.1%)	5 (13.9%)	5 (13.9%)	4 (11.1%)	
Question 14	16 (15%)	10 (9.3%)	31 (29%)	50 (46.7%)	
Question 15	80 (63.5%)	46 (36.5%)			
Question 16	28 (22.2%)	98 (77.8%)			
Question 17	The average age of the respondents was 22.5 years.				
Question 18	68 (54%)	58 (46%)			
Question 19	23 (18%)	82 (65%)	21 (17%)		

Table 17: Car insurance and the purchase price of the car

Type of vehicle insurance	Purchase price of car	Respondents (percentage)
Motor vehicle liability insurance	< 100 000 NOK	9 (18%)
	>100 000 NOK	3 (6%)
Limited own damage cover	< 100 000 NOK	14 (28%)
	>100 000 NOK	4 (8%)
Comprehensive motor insurance	< 100 000 NOK	6 (12%)
	>100 000 NOK	14 (28%)

The car insurances above are rated from the cheapest to the most expensive.