Master Thesis

The influence of language on decision-making

ERASMUS UNIVERSITY ROTTERDAM

Erasmus School of Economics

Master Program Behavioral Economics 2014-2015

Author: BSc. Juan de Weger (347822)

Supervisor: Yu Gao

Date: 9-7-2015

Table of Contents

Preface

After a long and intensive five year period of studying I am proud to present my master thesis. While Business Economics was not the first thing I had in mind to specialize in, I must say that I enjoyed every moment of it. I would like to thank everyone that has supported me throughout the years in my study during the easy and hard periods. A special thanks to everyone that helped me with the thesis. I would like to thank my supervisor Yu Gao for giving me advice on how to construct the questionnaire and make sure it was feasible enough. I am grateful for every person that filled in the questionnaire and made me finishing my thesis a reality. I hope you enjoy reading my final work as a student as much as I have enjoyed typing it.

Abstract

This thesis gives an insight on classical experiments and the relevancy of them in Dutch society. Dutch students are indeed prone to effects of framing and ambiguity aversion. However, the main research question of this thesis is whether a change in language type leads to students deciding differently on classical economic questions. A survey testing for violations of expected utility was implemented to test for rationality between subjects. The main finding of the research is that the language type does not lead to subjects behaving more or less rationally. While subjects do violate expected utility and are not always rational, language type did not make a significant difference on the decisions made. The only influence a change in language type had was during emotional heavy questions. Students take a more utilitarian approach to moral heavy questions when this is asked in a non-native language.

1. Introduction

1.1 Background and context

Behavioural economics has risen in popularity the last few decades. While classical models such as expected utility assume rationality, we see a growing amount of literature in which this is not the case. Economists need to look at reasons why investors do not always act rationally. Possible explanations for this irrational behavior are so called biases (Tversky & Kahneman, 1974). Instead of applying hard mathematical computations about what gives a person the highest utility, people use rule of thumbs to make this process a lot easier. Some examples of well-known biases are overconfidence (Moore & Healy, 2008) and optimism (Dejoy, 1989). Research has shown that when persons were asked to grade their own driving skills compared to others, they genuinely believed they were above average. While this might not seem related to decision-making at first, it is actually important to understand that people are subject to biases and that you have to look out for behavioral pitfalls. These deviations from normatively accepted choices allows for violations of the expected utility model.

However, research has shown that not only biases can cause changes in decision-making. The proficiency in language can play a role as well. A recent paper written by Keysar, Hayakawa and Gyu An (2012) uncovered that forcing people to answer questions in a secondary language systematically reduced their biases. This way their results were relatively more rational compared to the results of the questionnaire in their mother language. Co-author Hayakawa even emphasizes how certain emotional values could get lost in translation for a non-native. They argued that thinking in a foreign language causes individuals to distance themselves from intuitive and emotional thinking and instead judge questions with less emotional resonance.

1.2 Research objectives and hypotheses

This paper will try and build a bridge between previous literature results and its applicability on Dutch students. It also gives an insight on the relevance between language and the decision-making process. Can the results from previous studies be found under Dutch students as well? My research questions are as followed:

- Does asking questions in a non-native language make students decide differently?
    - Are subjects more or less prone to framing when asked questions in a non-native language?
    - Do they violate expected utility more often when asked questions in a non-native language?
    - Do subjects exhibit more or less ambiguity aversion when asked in a non-native language?
    - Are possible changes in decision-making mainly present at emotionally heavy questions?

The following hypotheses are derived from the questions above:

- Individuals exhibit decisions differently when they make these in a non-native language.
    - Individuals are less prone to framing in their decision-making when asked in a non-native language.
    - People violate expected utility less when asked in a non-native language

- There is less ambiguity aversion under non-native language questions
- Subjects take a more utilitarian approach to decisions when the question is presented in a non-native language

These research questions and hypotheses are supported by a literature review on the different biases and information that relates to the topic. The thesis delves further into the relationship between language and cognitive abilities and emotions. Violations of the expected utility theory have led to the creation of the alternative theories like the prospect theory. The experiments from prospect theory will provide as a basis for testing whether individuals violate expected utility.

The thesis has the following structure: Section 2 will discuss the literature review that is relevant for the experiment. Section 3 mentions the methodology and data collection process. After this Section 4 describes the primary results from the research. In section 5 and 6 conclusions are given together with limitations and remarks for future research about the topic.

2. Literature Review

The literature review is constructed as followed. At first section 2.1 discusses the Asian Disease problematic. This is a well-known example of changes in human decision-making due to framing. Section 2.2 will focus on the common ratio effect together with the main axioms of expected utility. After this section 2.3 will discuss the Ellsberg Paradox and its implications in this research. Section 2.4 looks at the utilitarian decisions humans make at moral heavy questions. Section 2.5 will mention the dual processing theory together with the role of emotion and affect on decision-making. Finally, section 2.6 will highlight the main findings of previous important literature studies.

2.1 Asian Disease

While expected utility gives a normative approach of people's decisions, prospect theory is a descriptive theory that can explain choices that normative theories cannot (Kahneman & Tversky, 1979). Seemingly irrelevant information can indeed make individuals decide differently (Schwarz, Strack, Hilton & Naderer, 1991; Tversky & Kahneman, 1981). According to the Expected Utility theory a persons' preferences should not change due to the way the question is formulated (Von Neumann & Morgenstern, 1947). In practice Tversky and Kahneman (1981) found that people evaluate gains and losses from a reference point instead of a complete state of wealth. While risk aversion itself is not a violation of expected utility, it becomes one when irrelevant data causes changes in behaviour. In other words, does framing lead to different results in ones decision-making?

A well-known example is the Asian Disease, an experiment that states the same choices but framed differently (Tversky & Kahneman, 1981). The first choices are framed positively and the second part of choices is framed negatively. The Asian Disease from their article is as followed:

"Imagine that your country is preparing for the outbreak of an unusual disease, which is expected to kill 600 people. Two alternative programs to combat the disease have been

proposed. Assume that the exact scientific estimates of the consequences of the programs are as follows:

'Positively framed'

- **If Program A is adopted, 200 people will be saved.**
- **If Program B is adopted, there is 1/3 probability that 600 people will be saved, and 2/3 probability that no people will be saved.**

'Negatively framed'

- **If Program A is adopted 400 people will die.**
- **If Program B is adopted there is 1/3 probability that nobody will die, and 2/3 probability that 600 people will die."**

What this shows is that seemingly irrelevant changes to the outcome statement have significant changes in one's preference. The main tendency is that people are risk-seeking for losses and risk-averse for gains (Kahneman & Tversky, 1979). By altering the question from positive to negative terms, subjects make a switch. However, people prefer avoiding a loss over gaining the same amount as a gain, a phenomenon known as loss aversion. Both the gain and loss utility function satiate, which causes individuals to either segregate or integrate gains and losses. It all depends on how much satisfaction they receive from it. Small losses hurt a lot, so they will be integrated together with gains to reduce the pain of feeling a loss. Small gains on the other hand will be segregated from big losses, as the small gains give him a small pleasure which is bigger than the combined dissatisfaction from the huge loss (Thaler, 1985). Another important finding in prospect theory is the non-linearity of the probability weighting function. Expected utility assumes a linear probability function, although in reality people are subject to uncertainty. People generally overweight small probabilities and probabilities reaching certainty, while underweighting probabilities in the middle. The way people make choices under uncertainty is documented under the Ellsberg paradox which will be discussed later on.

2.2 Common Ratio effect

Standard economics tries to explain how a person makes their decisions through the expected utility theory. The model tells us what an agent should normatively pick if he behaves rationally and is self-satisficing (Schoemaker, 1982). The agent looks at his future outcomes and assigns objective probabilities to it. He then ultimately picks the option that maximizes his expected utility (Friedman & Savage, 1952). In practice it is not always easy to assign an objective probability to an uncertain outcome. The subjective expected utility model however, makes an estimate of the potential likelihood of outcomes under uncertainty (Fishburn, 1981). The main drivers of this model are the four axioms written by Von-Neumann and Morgenstern in 1947. In order to understand these axioms, imagine the following situation:

There are three different lotteries ready to be played, respectively called A^L, B^L and C^L. The potential outcomes are defined as followed:

$$A^L = (x1, p1\ ;\ x2, p2\ ;\ \dots\ ;\ xn; pn),$$
$$B^L = (x1, p1\ ;\ x2, p2\ ;\ \dots\ ;\ xn; pn),$$
$$C^L = (x1, p1\ ;\ x2, p2\ ;\ \dots\ ;\ xn; pn).$$

The values of *X* are the possible payoffs whereas the *P* stands for the probabilities of the payoff happening. In order to not violate expected utility, the following four axioms have to hold: Completeness, Transitivity, Independence and Continuity.

Completeness: A subject either prefers lottery A^L over B^L, B^L over A^L or is indifferent between both lotteries. In other words, completeness holds as long as the person has well defined ideas of what he/she prefers.

Transitivity: If $A^L \succ B^L$ and $B^L \succ C^L$, than a person should pick $A^L \succ C^L$ as well. Similarly, if a person prefers lottery A^L over playing lottery B^L, but lottery B^L over lottery C^L, a rational person should prefer lottery A^L over C^L. In practice this axiom is prone to violation (Loomes, Starmer & Sugden, 1991).

Independence: If someone prefers lottery A^L over C^L, then adding a combination of B^L into the decision-making process should not change the initial preference from A^L over C^L.

Adding the other lottery to both options should be deemed as irrelevant and therefore does not change one's decision.

Continuity: If $A^L \succ B^L \succ C^L$ then there exists a combination of A and C that makes you indifferent between those two options and B^L, as in: $P * A^L + (1-p) * C^L \sim B^L$. This assumes that P takes a value between 0 and 1.

The axiom this thesis will focus on is going to be the independence axiom. If people are given the option between a certain amount for sure or a higher payoff but with more risk, they tend to go for the certain option (Tversky & Kahneman, 1986). This is deemed the certainty effect. If the probabilities of both options get reduced by the same amount, people will actually make a switch in their preferences (Tversky & Kahneman, 1986). This has been dubbed the common ratio effect. This effect is known to make subjects violate the independence axiom (Cerreia-Vioglio, Dillenberger & Ortoleva, 2013). By violating this axiom they also indirectly violate the expected utility theory. This thesis will implement and replicate a betting test to see whether the common ratio and certainty effect are present among Dutch students.

2.3 Ambiguity Aversion

In theory researchers talk a lot about risk. They assess probabilities to an event and evaluate it. In practice, probabilities are not always known. Instead of risk, people are subject to uncertainty and do not know the probability of an event from happening. Ellsberg (1961) did a research showing the difference between ambiguity and risk aversion. People were given the choice between two urns containing both 100 marbles. One urn (Urn A) had an even split of 50 red marbles and 50 black marbles, whereas the other urn (Urn B) had an unknown probability distribution. Participants were then asked to play a hypothetical game where they would earn money if they would draw the predetermined color. At first, subjects were asked to try and draw a red marble. The subjects preferred the known urn and therefore stated that their probability of winning in this case was higher by playing Urn A over Urn B.

As the probability of drawing a red marble is 50% in Urn A, the probability of drawing a red marble in Urn B was deemed as lower than 50%: $(P(Urn\ A) > P(Urn\ B))$. However, after the color they had to grab turned into black, subjects still exhibited the preference of Urn A

over Urn B. The probability of drawing a black marble in Urn B was therefore once again lower than 50%. Probability wise, this result does not make sense as the cumulative probabilities of Urn B do not add up to 100%. This has been classified as the Ellsberg paradox/ambiguity aversion. A person might have higher forms of risk aversion when ambiguity is present as well. This thesis will implement the classic urn example in order to see whether language makes a person more ambiguity averse or not.

The reason why ambiguity aversion gets included in the thesis as well is due to the fact it used to be one of the most robust findings in behavioural economic literature. Keren and Gerritsen (1999) did numerous experiments on the validity of the Ellsberg paradox by changing the framing and information of the experiment. Perceived informativeness was their major driver for the amount of ambiguity a person exhibited. The 'certainty effect' is also associated with a form of ambiguity avoidance. While ambiguity aversion still plays an important role in decision-making under risk, it is also subject to criticism. Heath and Tversky (1991) found contradicting results when people were asked to bet on vague events that they had a lot of knowledge about. Due to the perceived sense of control and superior information, a person might underweight the possibility of losing the vague event over the certain bet.

As beliefs are important determinants in the decision-making process, someone who beliefs he is specialized in a topic could therefore be ambiguity seeking. If a person with a lot of knowledge in football is given the choice between a certain and ambiguous football bet, he tends to be more risk seeking. So not only does vagueness of the event explain ambiguity aversion, competence and informativeness do as well. Fox and Tversky (1995) also found that making a comparison between two events is of importance to ambiguity aversion. In their experiment they had a group which had to decide between a certain gamble and a vague (uncertain) gamble. The other group was presented with only one type of gamble, either certain or uncertain. The first one had a comparative context, whereas the second group got a noncomparative context. When two events were compared with one another, subjects showed forms of ambiguity aversion. However, when the events were evaluated separately, aversion for the vague event was lower. This was dubbed as the comparative ignorance hypothesis. Fox and Weber (2002) found confirming results for it as well, as

ambiguity aversion was driven mainly by competence and the idea of comparing two events. If a person gets exposed more deeply to the fact that there is a contrast in knowledge between him and the gamble, he becomes more ambiguity averse. The more salient this lack of knowledge is made, the less a subject took the more vague option. The comparative ignorance hypothesis can be an explanation to people liking or disliking uncertain gambles.

However, the comparative ignorance theory also has some critique. The difference between a comparative and noncomparative gamble is subjective to the authors. Although the experimenter tries to influence the context and way of thinking of their subjects, it is hard to determine whether subjects will actually make a comparison. It could well be that the participants in the noncomparative experiment would compare it in their mind with a 50/50 bet as well. The study done by Arlo-Costa and Helzner (2005) found ambiguity averse behavior in noncomparative cases as well. They conclude that while the comparative ignorance hypothesis has some merit in understanding decision-making, it is not the full answer. Subjects do seem to take vagueness into account when they evaluate uncertain prospects.

2.4 Utilitarianism

Not only economical questions can be affected by the power of language, moral questions as well. Costa, Foucart, Hayakawa, Aparici, Apesteguia, Heafner & Keysar (2014) found confirming evidence for a switch in behavior when it comes to moral heavy dilemmas. Subjects were asked to imagine five people on a railroad track. A trolley was on the loose and about to run over them. You happen to be next to a switch which can make the trolley move over to a different direction. By pulling over the switch you save the lives of the five people standing on the track. However, there is one person standing on the other track as well. People are then asked to pull the switch and save five lives at the cost of one, or leave the switch untampered. This trolley example was asked in both their native language and English. The results were about the same for both groups. A variation of this question was also asked in the study, but on a separate group. In this variation the only way to stop the trolley is to push a fat man in front of the trolley. Is a person willing to kill a man in order to save the lives of five people? A utilitarian approach would say yes, as five lives are greater than one. This is however a moral heavy subject, as the person making the decision gets a

stronger feeling of actually committing a murder. The switch example is more distant, whereas the fat man variation of the question is a lot more visceral. The variation trolley question showed that people acted a lot more utilitarian in English, compared to their native language. This study had a large sample size of students, making the results even more robust. It is still arguable why a person makes this switch so often, as we have yet to fully understand the human mind and the way it processes information.

The dual process theory by William James could shed some light to these findings. The model implies that the human mind has two systems, an unconscious and conscious reasoning part (Frankish & Evans, 2009). The unconscious part allows for fast and automated decisions with low effort, whereas the conscious part is the analytical and slow-processed part of the human mind (Kahneman, 2003). People could have trouble processing all the information, leading to a more analytical approach to choices in a non-native language (Alter, Oppenheimer, Epley, & Eyre, 2007). This is discussed by Pavlenko (2005) and Ayçiçeği & Harris (2004), who found that a non-native language may produce greater distance because it is less manifested in the emotional thinking system than a native language. Although biases and heuristics are important, we should not undermine the effect of emotion (Naqvi, Shiv, & Bechara, 2006) and affect (Slovic, Finucane, Peters, & MacGregoron, 2002) in daily decision-makings.

In the case of the trolley example the variation is framed differently. It has a higher emphasis on killing someone over saving five people. Although the variation and original example have the same outcome, one leads to a stronger moral conflict in oneself. The act of pushing someone over is more extreme than turning a switch in order to save five people. In the case of pushing the fat man emotions could cause the person to feel morally wrong of pushing someone else over the edge. The dual process theory tells us that as our intuitive part is more entwined with our emotions, it could lead to a stronger feeling of guilt related to killing a person. Therefore reading the thought experiment in a native language could make the guilt and affect of a person more salient compared to a non-native language. The original example was not framed as morally heavy and could therefore lead to the finding of no difference. While people still had to think with their emotions, their guilt feelings were relatively lower as they did not have to actively push someone over. Because the moral issue was less pronounced there was also less space for emotional differences in choice.

2.5 Emotion and decision-making

Facts and logic alone do not always make people decide on which option to choose (Bechara, 2004). Emotions are an important determinant in decision-making as they can lead to biases and other distortions (De Martino, Kumaran, Seymour & Dolan, 2006). Emotions are defined as short and brief reactions that arise spontaneously due to either something happening in the body or brain. People will form their beliefs wrongly about events that give them pleasure even if there is information about their beliefs being wrong (Frijda, Manstead & Bem, 2000). In the case of displeasure people are reluctant to update their beliefs due to the unpleasant feelings it gives.

A good example is the disposition effect. Investors tend to hold stocks that depreciated in value and sell those that are trading for a premium. The pleasure a person derives from selling the stocks is worth more than holding the stocks. Positive emotions related to selling the stock can cause a person to get a sense of fulfillment and happiness, even if the stock could have risen in the near future (Odean, 1998). If a stock goes down however, investors are reluctant to sell their stocks and it actually gives them a sense of displeasure if they eventually do. Loss aversion and cognitive dissonance explain this phenomenon partially, together with emotions. Losses hurt more than gains give pleasure and information that contradicts someone's ideas causes them to sometimes neglect the information. People do have a higher emotional brain activity during the sell of a share that is in the money (Frydman, Barberis, Camerer, Bossaerts & Rangel, 2011). Selling a share that is below the money causes negative emotions.

Emotional feelings can either be individually or linked to group pressure (Matz & Wood, 2005). Although emotions influence a person's decision-making, it varies between the types of emotion. Fear leads to people perceiving an event to be more uncertain, whereas anger leads to quick and hasty decisions that are not always based on analytical reasoning (Litvak, Lerner, Tiedens & Shonk, 2010). Guilt seems to be a very important and influential emotion in the judgment and decision-making (Angie, Connelly, Waples & Kligyte, 2011). Feelings of responsibility and future guilt lead to a reconciliation of past choices made. The same applies to stress. Increasing an individual's stress level makes them more prone to altering their decisions, mainly in the case of acute stress situations (Starcke, Polzer, Wolf & Brand, 2011).

Not only are emotions relevant to decision-making, the lack of emotions is as well. Damasio (2008) noted that people with braindamage were more indecisive than others. In his research he had a group of individuals who all suffered a form of braindamage around the part of the brain that regulates emotions. They all had in common that they were indecisive about choices. While the subjects were able to mention both positive and negative outcomes of each choice, they found it hard to pick one over the other.

Not only is emotion important in making decisions, it can also lead to making irrational ones as well (De Martino et al, 2006). Neuroscientists had their own approach for testing emotion and rationality as well. The effect of framing and emotion was tested in a gambling experiment, which showed that the persons who made more rational decisions had more activity in their prefrontal cortex. This part of the brain is used more intensively in the case of reasoning. They also found that another part of the brain, the amygdala, caused subjects to think more emotionally and be more subject to biases.

To explain fully how the human mind works, Damasio (2008) came up with the somatic marker hypothesis. Instead of persons being fully rational and calculating hard mathematical computations, they let emotional processes influence them in their daily life. Bechara, Damasio & Damasio (2000) argue that emotions are changes in both the body and mind due to outside stimulances. Changes in the body can send signals to the brain in order to form it into an appropriate emotion related to the physiological changes made. For example, if a stimuli from outside makes a person get goosebumps the brain might associate it with something unpleasant. The brain therefore transforms this feeling into a negative emotion due to the stimuli. If the stimulus is positive and leads to positive changes in a physiological way, the mind can then create a more positive emotion towards the stimuli. These created emotions then guide a person through their decision-making behavior. The stimuli are therefore markers that either occurs on a conscious level or subconsciously. These markers can occur both by changes in the body or by imagining situations in the mind. In order to test whether these signals are truly significant for ones choices, researchers implemented the Iowa gambling task (Bechara, Damasio, Damasio & Anderson, 1994).

This task is a collaboration between important scholars of neuroscience. The setup of the experiment is simple; there are four card decks to choose from. Choosing one of the decks and drawing a card from it earns you some money. However, sometimes you draw a card that makes you lose money. There are decks with relatively high 'good cards' and decks with relatively high 'bad cards'. In other words, by playing this game an extended amount of time people should prefer choosing the good decks over the bad decks. To see whether the Somatic Marker Hypothesis holds, the researchers look at changes in stress levels. The researchers noticed how subconsciously a subjects stress levels would rise as soon as they hovered over the bad decks. This was still early into the experiment, so they arguably did not know consciously that some decks were stacked against them. The longer the experiment moved on, the more obvious it became for the subjects that some decks were worse than others. Healthy subjects therefore steered away from the bad decks and stayed on the good ones for the remainder of the experiment.

However, there were also participants with varying types of braindamage or lesions. Patients that had these lesions never got fully stimulated by the markers and therefore showed behavior that was off from the healthy patients. Some never stopped picking bad decks whereas others picked ones that gave them high immediate gains. Interestingly enough, their stress levels never truly deviated as much compared to the group without lesions. This therefore showed that there is a connection between body and mind and stimuli that create these emotions. These emotions then play an important role in the choices one makes and sticks with. While this thesis does not mimic the Iowa gambling task, this experiment was groundbreaking as it showed the importance of emotions on choice.

Another way of explaining emotions while making decisions is the Loewenstein-Lerner theory (Loewenstein & Lerner, 2003). They split up emotions into two categories, one based on anticipation and the other one on immediate gratification. An example is the idea to lose weight. One gets positive feelings and emotions over the anticipation of losing weight. On the other hand a person can fail to lose this weight and therefore anticipate failure. As people are regret averse they might decide to not lose weight even though they would prefer to if they could. Not only does the outcome matter, but the amount of time in between results as well. A study done by Thaler (1981) found out that if people were given the choice between getting an X amount of money now or a Y amount of money next week,

that they preferred the first choice. Even though the pay-off from X was smaller than Y, the anticipation of getting the money right now weighed more than waiting a period. When this test was repeated but with subjects getting X next week or Y in two weeks, people preferred the latter one (Thaler, 1981). This showed that humans are not always time consistent in their discounting. One reason for a switch in these results is the anticipation or regret of not taking the money right away (Loomes & Sugden, 1982).

Immediate emotions on the other hand can cause for decisions made based on affect (Loewenstein & Lerner, 2003). If a person with a phobia for flying is asked to use an airplane as travelling method, they will most likely refuse. The intense feelings of fear or perhaps anger override factual statistics like the rate of airplane crashes. Even though the airplane casualties are statistically lower than casualties by automobiles, a person afraid of flying is still going to pick travelling by car.

2.6 Previous Literature studies

There has been a growing amount of literature recently on the effects of language on decision-making. Keysar, Hayakawa & Gyu An (2012) did numerous experiments which resulted in findings that showed thinking in a foreign language could reduce ones biases. Effects of framing and loss aversion were all lower for the group making the experiments in a non-native language. In other words, the change of language made them systematically less irrational. This was tested on a variety of students from different origins. There were a total of five groups: Korean, French, Japanese, Spanish, and Chinese.
Each group got a questionnaire to test for degrees of loss-aversion and effects of framing. Interestingly enough, this also holds for students who had a Chinese heritage and understanding of Chinese, but were raised in a Western environment. A research done by Chen, Rau & Yao (2014) showed that Western-Chinese were more rational when asked questions in Chinese compared to English. As they grew up fully exposed to English they have a bigger emotional resonance with the English language. However, they also grew up with the Chinese language through their parents, so what is the reason for this deviation among bilinguals?

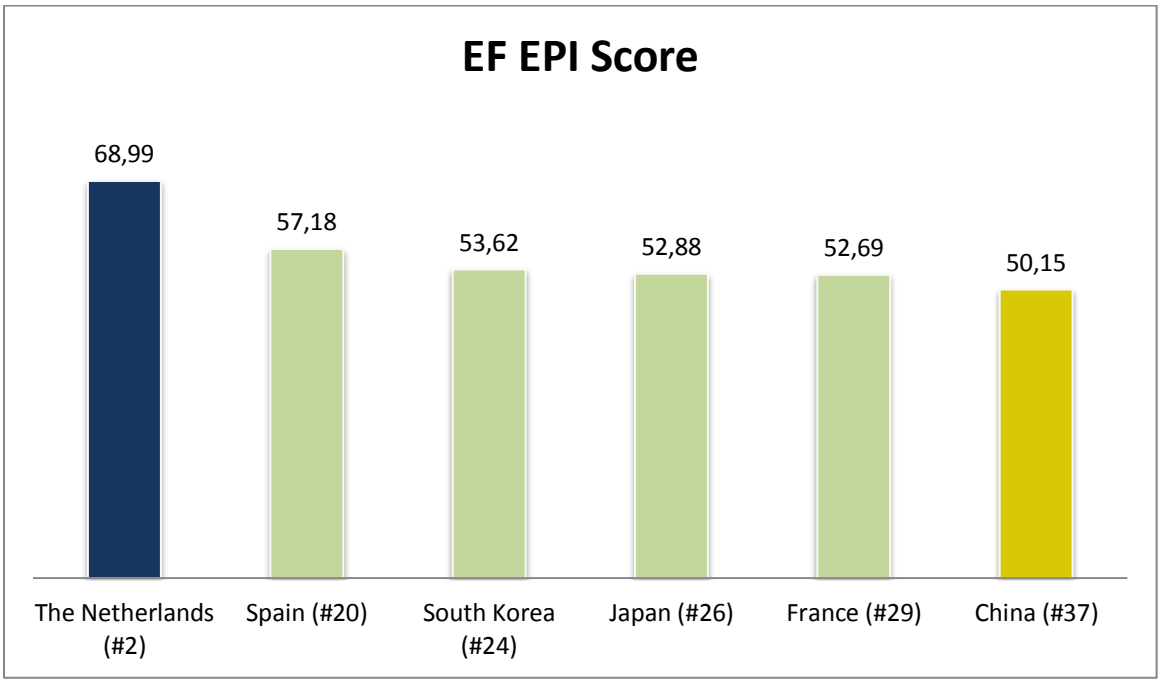
The authors argue that cultural differences could lead to changes in behavior. Certain traits are more common or respected in one culture over the other. While the Western cultures have a higher sense of individualism, Eastern cultures could represent a more collective point of view (Chen, Rau & Yao, 2014). Due to this higher form of collectivism a person reasons more about the future consequences of their behavior. This in return could cause a more rational approach to situations compared to a more individual, Western approach. The form of language also leads to a stronger feeling towards norms and values associated with that culture (Chen & Bond, 2010). If someone tries to identify with a group, his or her motivation might shift into something that is more socially approved by the corresponding culture.

Language could possibly prime someone into thinking either like an individual or more collectively. According to Trafimow, Silverman, Fan & Law (1997) humans have a different set of cognitive processes. These processes are either more collective heavy or private (individual) heavy. By using a language that is more collectivistic the mind primes itself into using more collective cognitive processes. On the other hand, by using an individualistic language it could lead to the brain using more private cognitive processes. Finally, the language context can lead subjects to thinking as part of the language group. Chen and Bond (2010) concluded that while language does not fully change ones personality, it does have effects on the persons perceived cultural norms and values. Using a second language makes them use the cultural values associated with that language. Cognitive dissonance therefore could lead to a person making a decision he disagrees with himself, but knows it is best for the collective good.

Keysar, Hayakawa & Gyu An (2012) also did numerous researches on the influence of language on rational decision-making. They used classical experiments in order to test for violations of the axioms of expected utility. Their results were significant for a wide arrange of countries, namely: Korean, Japanese, Chinese, Spanish and French. While these results do show that language can indeed make a person think differently, the question remains whether this is applicable to the Dutch population as well. One thing my research deviates from the previous mentioned ones is that it will compare Dutch to English. A lot of the younger Dutch generation is exposed to English on a daily basis and know it to a certain

degree. While this makes possible research easier (more people are proficient enough in English), it could potentially lead to different conclusions. One can argue that due to more similarities of the languages the effect might not be as strong among Dutch people compared to a language as Korean. As Asian languages are very different from English, it might have required a lot of cognitive effort to fully understand the task that was being asked. As mentioned earlier, if a person has to use a relative higher amount of effort, he might switch into thinking more through logic. This could lead to the Asian subjects to think more through their second system of the brain (the one based on reasoning). While France and Spain are not Asian languages, the proficiency in these countries is also lower than the Dutch proficiency in English. This is based on the EF English Proficiency Index.

Figure 1. EF EPI Index



Note: a total of 63 countries were tested for their EPI score. The color represents the degree of fluency for each country. Blue is a very high proficiency, green stands for a moderate proficiency and yellow means a low proficiency. French and Spanish people have a moderate understanding of English, while Dutch people have a very high proficiency. This research will try to investigate if the higher proficiency among Dutch students made the results from previous researches invalid.

3. Data & Methodology

The influence of language will be tested through a survey. This survey consists of numerous questions, each trying to test something differently. There are two versions of the survey. Both surveys have the same questions in them. However, one is in Dutch and the other is in English. Every respondent to either survey has to be native Dutch in order to investigate the relationship between language differentials and decisions. The questionnaire itself has four major parts in it that will be used to test the earlier mentioned hypotheses. These questions are mainly replicates from previous studies and will be selected in order to test all research questions to a degree. If a respondent violates one of these questions, they are either violating expected utility or are more susceptible to framing. It is assumed that if a person violates expected utility or shows susceptibility to framing that he has a bigger chance to show irrational behaviour. While it might be more optimal to construct numerous surveys (perhaps 2 independent surveys for each research questions), feasibility is also of importance. Previous research found positive relationships between rational decision making and 'language framing'; it remains whether this is applicable to native Dutch. Dutch speakers are exposed to a lot of English on a daily basis, where especially the younger generation has a profound knowledge in the language. With the current globalization and increasing bilingual persons it is interesting to investigate if language is really of importance in the decision making of an individual and in what cases we can apply it to.

The survey shall consist of the following questions, each chosen for a specific reason:

- The Asian Disease problem (to look at the effect of framing on gains and losses).
- Three bets (to look for the certainty and common ratio effect)
- A urn question based on the Ellsberg Paradox
- A moral question based on utilitarian behavior (trolley example)

The Asian disease problem will test if there is a difference between language type and susceptibility to framing. The questionnaire starts by explaining the Asian disease choices and then asks each participant to pick their preferred option. The first option allows a certain amount of people to be saved, whereas the second option has a risky potential of

saving everyone or no one. This question is asked once again at a later part of the survey, but the outcomes are framed differently. The questions asked are the exact same as in the original Tversky and Kahneman paper from 1981. We compare the choices made by the native language group with the foreign language one. There are two groups and the data is non-parametric. Throughout this thesis the data will be tested for differences through Exact-Fisher tests. If there are no differences in answers between groups caused by language type, the Exact-Fisher p-value will be higher than 1, 5 or 10% (dependent on the alpha value). The phi coefficient is used as well in order to look at association between the nominal data.

Another major part of the survey is a question involving three bets. The first bet gives you the option between winning 30 euros certain or 45 euros with eighty percent probability. Previous research found a preference for the certain 30 euros over the riskier bet (certainty effect). The second bet is winning either 30 euros with 65% or 45 euros with 25%. This bet is mainly placed in order to make it less obvious of what the survey is trying to test. After all, the third bet is the same as the first one, but with different probabilities. The probabilities of the first bet have been divided by four for the third bet. What was once a certain bet is now only a 25% chance of winning 30 euros. Instead of a chance of 80% of winning 45 euros, it is now reduced to 20%. This betting example will be worded similar to the experiment done by Tversky & Kahneman in 1986. Even though both bet options get the same reduction in probability, people tend to prefer the second option now. While the certainty effect made people choose the first option, the common ratio effect reverses this. However, does language make one more prone to these effects or do choices not differ at al? Once again survey results will be tested for differences through an Exact Fisher test.

The third important part of the survey is the test for ambiguity aversion based on the Ellsberg experiment in 1961. Two urns are hypothetically placed in front of the person. Both urns have 100 marbles in them. Urn A has an even split of 50 red and 50 blue marbles. Urn B has 100 marbles too, but the distribution is not known. It is just as likely for there to be 90 red marbles in it as there would be only 10. Subjects would win hypothetical money by drawing the right color out of an urn. The participants are first asked which urn they would pick in order to draw a red marble. Later on the question is repeated, but this time a blue marble is asked to draw out of an urn. Does the language type influence a person's preferred

urn? Does ambiguity aversion increase in one group? An exact fisher test is used between groups to find out if there were differences.

Finally, the fourth major element of the questionnaire is an emotional heavy question. There is a trolley on the loose and heading towards five people. The only way to save them is to pull a switch and change the trolleys' route. Will you do nothing or do you pull over the switch? Later on subjects were given a variation of the question where instead of pulling a switch one had to push a fat man of a bridge. Does the language type cause people to pick an option more often than the other? The trolley problems used in this research are generalized versions of the classic example written by Philippa Foot (1967) and the fat man variation by Judith Jarvis Thomson (1985). The comparison between answers will once again be tested by an exact fisher test.

Apart from the four major questions, other questions were in the survey as well. These were questions in order to test and rate ones English proficiency and understanding of the survey. Although language type is the main explanatory variable tested, other explanatory variables will be tested for their relationship with the main questions as well. This is to make sure that the results are due to the language type change and not due to a misunderstanding of the questions. It also tests whether there is a relationship between English proficiency and decision-making.

In these extra questions participants are asked to rate their speaking, understanding and reading of English on a scale of 1 to 10. It is to see whether subjective English proficiency explains differences in choices. Subjects were also asked to rate what helped them most in learning a foreign language on a scale of 0 to 10. However, overconfidence and optimism can lead to too high ratings of the subjects English proficiency. Therefore a few control questions were included to identify a more objective measure of proficiency. A total of five English sentences were left incomplete and subjects were asked to pick the right answer off of the multiple choices they had. A score from 0 to 5 was then constructed. These sentences were derived from the Cambridge Certificate of Proficiency in English test (Esl-Lounge, 2013). Finally, there were three questions in the survey that tested for someone's cognitive skills (Frederick, 2005). These variables were then used to set up a probit regression model with the four main questions as the dependent variables. Each one of the four questions has a

separate probit regression. Due to the non-linearity of the model the coefficients themselves can only be interpreted through the sign. However, the average marginal effects have been calculated as well and are interpreted for each separate model. Next to the results itself, individual characteristics such as age and level of education were asked at the end of the questionnaires. Like mentioned before, one could argue that the younger generations have a better understanding of English and therefore might be less influenced by the change in language. Level of education could be an indicator for the amount of analytical prowess a person has. These variables are therefore included in the same probit regression model. The marginal effects of each independent variable are given in order to interpret the coefficients. There are different methods to calculate the marginal effects. This thesis uses the average fitted value of the subjects in the survey in order to calculate the average marginal effects. The reason behind this is that certain values from the independent variables are unrealistic to take the mean from. For example, having an average mean for the variable *Gender* of 0.6 is not something that occurs in reality. A person is either assigned a value of 0 or 1. By calculating the value of each person in the survey and averaging it, the values for the variables themselves do not have to take on unrealistic values. The questionnaire can be found (in paper format) under Appendix A.

4. Results

A total of 94 individuals enrolled into the experiment and completely filled in the questionnaire. Any person that did not have Dutch as their native language or first language was removed from the final results. This left the experiment with a total of 41 subjects that finished the survey in Dutch, and 45 subjects that received an English version of the questionnaire. The data is fully expressed in categorical/nominal values. First the initial descriptive statistics of the survey shall be discussed together with tests on differences between both groups. As we are dealing with nominal data, the Fisher exact test is implemented. It is to see whether the native group made more or less rational decisions. Language type is the main variable tested.

Table 1. Survey demographics summary

VARIABLES	GENDER COUNT	EDUCATION LEVEL COUNT	CURRENT OCCUPATION COUNT
MALE	58		
FEMALE	28		
MIDDLE SCHOOL		2	
BACHELOR		38	
MASTER		44	
STUDENT			69
WORKING			17
AVERAGE AGE	23,91		

The sample consisted of 58 male respondents and 28 female respondents (Table 1). The average age among students was 23,91 with an almost split amount of them having an education level of either highschool/bachelor(38) or master (44). There were only a few respondents with a lower education. Out of the subjects 69 were still studying and 17 were actively working. This makes the group very homogenous apart from the male to female ratio and the student to working ratio. However, the subjects that did work were mainly around the age of 25-30, so it is a valid assumption that they only shortly started working.

4.1 Asian Disease results

Firstly, the Asian disease results will be discussed.

Three different variables are constructed through the answers subjects provided: *AsianGain*, *AsianLoss* and *AsianViolation.* *AsianGain* tells us the option subjects picked in the version of the Asian disease that was framed towards gains. A value of 1 stands for the subject picking option 1 (the more certain choice), while 2 tells us that the subject chose the riskier option. *AsianLoss* is constructed the same way, but with the initial question framed in terms of losses. For example, if a subject chooses to go with a more certain program in both cases, then both variables get a value of 1 attached to it. If a subject chose the second (riskier) outcome, it would change to a value of 2. Finally, the varlable *AsianViolation* is assigned a value of either 0 or 1. This will be the value 1 if subjects are inconsistent in their choices and 0 for if they remained with the same answer in both cases. In other words, if a person chooses option 1 in the gain version, but option 2 in the loss version, he would be inconsistent and exhibit a violation. Each subject is then assigned to either native or foreign group, dependent on which version of the questionnaire they had to fill in.

Table 2. Asian disease Results

VARIABLES	CHOICES	LANGUAGE TYPE		EXACT FISHER	PHI COEFFICIENT
		Foreign	Native		
		Count	Count		
ASIANGAIN	1	28	28	0,652	-0,064
	2	17	13		
ASIANLOSS	1	17	14	0,823	0,038
	2	28	27		
ASIANVIOLATION	0	26	17	0,195	0,163
	1	19	24		

When compared to one another, both the foreign and native group seem to have a preference of the relatively safer option when the Asian Disease is framed In terms of gains (Table 2). 28 out of 45 subjects in the treatment group and 28 out of 41 in the control group opted for the first option. It does not come as a surprise that there is no significant difference between the Foreign group and Native group (p=.652). There seems to be a small

negative association between language type and choosing the risky option In the *AsianGain* question (phi=-0.064). Changing the language from foreign to native lead to a small increase in the relative amount of certain choices picked. Interestingly enough, there was a similar pattern between both groups when the Asian Disease was framed in terms of losses. In this case a lot of subjects preferred the riskier program over the more secure one. 28 out of 45 and 27 out of 41 subjects picked the riskier option (p=.823). This can be a signal that the subjects' decisions were influenced by the framing of the question. The choices of the questions remained the same, yet the results show a shift from choosing the certain option for the *AsianGain* version to choosing the risky option in the *AsianLoss* version. In the *AsianLoss* version there is a small positive association between the risky option and changing the language type from foreign to native (phi=0.038). Students making the survey in Dutch would choose the riskier option relatively more often compared to those that read it in English.

Although subjects were more inconsistent with their choices, the *AsianViolation* variable was not significant either (p=,195). 19 out of 45 students in the English questionnaire and 24 out of 41 in the Dutch questionnaire made an inconsistent decision. This implies that percentagewise students were more likely to become inconsistent with their choices when reading the questionnaire in Dutch. They were more inclined to switch their preferences due to the question being rephrased In terms of gains or losses. The variable *AsianViolation* also has a positive phi coefficient (phi=0.163). This is an indicator that there is a positive association between changing the language type and amount of violations made in the Asian Disease question. Switching the language from foreign to native seems to have a positive relationship with the total amount of inconsistencies in the Asian Disease question. This is consistent with the finding of previous literature where Keysar et al (2012) found a significant relationship between language type and susceptibility to framing. However, they found a very significant result, whereas this study failed to replicate the significancy of the effect among Dutch students. Language type did **not** significantly influence the subjects' susceptibility to framing, yet the relationship between language type and vulnerability to fraiming remain the same as in previous literature. A non-native language indeed made a person become less prone to the effects of framing, but only to a small degree. The hypothesis of Dutch students being less prone to framing effects in a non-native language is

therefore only partially the case. There are signs of students indeed being less prone to framing due to asking the questions in a non-native language, but the results are not significant.

4.2 Bet violations

Now we shall delve further into how the Dutch students behaved when it came to making bets.

In order to calculate the Exact Fisher value for these bets the following variables are made: *Bet1*, *Bet2*, *Bet3* and *BetViolation*. *Bet1* has a value of 1 if a person chose the first option, and a value of 2 if the student chose the second option. This applies to the first bet. The same method is used to create *Bet2* and *Bet3*. As it is interesting to see whether students violate expected utility or not, we also construct the *BetViolation* variable. This variable either has the value of 0 or 1 attached to it. It is dependent on the answers given on bet 1 and bet 3. When someone went for the risky option in bet 1, he should also pick the risky option in bet 3. The same holds in the case of choosing the more certain options. A subject violated expected utility if they switched from the more certain bet to the riskier option or vice versa. This therefore attaches the value 1 to the *BetViolation* component.

Table 3. Bet Violation results

VARIABLES	CHOICES	LANGUAGE TYPE		EXACT FISHER	PHI COEFFICIENT
		Foreign	Native		
		Count	Count		
BET1	1	32	25	0,366	0,107
	2	13	16		
BET2	1	30	15	0,009*	0,301
	2	15	26		
BET3	1	15	12	0,817	0,044
	2	30	29		
BETVIOLATIONS	0	26	18	0,28	0,139
	1	19	23		

***: Significant under a 1% alpha**

All in all, the students show to have a preference for the certain amounts of money bets. Both the control and treatment group seemed risk averse for the first bet. 32 out of 45 and

25 out of 41 subjects chose the safer option in the first bet (Table 3). The value of the phi coefficient (0.107) states that there is a positive association between changing language from foreign to native and choosing the more risky option. Those that made the survey in Dutch were therefore relatively (although not significantly) more risk seeking in the first bet. Bet 3 on the other hard makes both groups become risk seeking. 30 out of 45 and 29 out of 41 participants preferred the riskier option. There is a confirmation of the students regularly violating expected utility and the independence axiom. However, there is no real significant difference between the foreign and native language groups. The positive phi value (0.044) once again indicates that the students that read the *Bet3* question in Dutch were choosing the riskier option relatively more. There is after all a positive association between the language type and the choices made on the third betting question.

Bet2 on the other hand is significantly different (p=,009). Students who made the questionnaire in their native language were actually more risk seeking compared to their foreign counterparts. It is not quite clear what made people switch more often. Perhaps this is an indicator that a native language supports risk seeking behavior due to familiarity with the language. Originally the second bet was mainly used as an extra bet In order to make the comparison between bet 1 and bet 3 less obvious.

The *BetViolation* component gives an insignificant Exact Fisher test value (p=,280). Same applies to the *Bet1* and *Bet3* variables (p=,366 and p=,817). There is evidence of a switch in behavior due to lowering the probabilities, but there is no significant difference between language types. 19 out of 45 (Foreign language) and 23 out of 41 (Native language) students were inconsistent in their decisions and violated the independence axiom in the process. The phi coefficient of 0.139 is once again positive and signals that switching the language type from foreign to native is associated with an increase in the amount of violations. The common ratio effect was more pronounced under the native language group. They therefore also violated the independence axiom and expected utility relatively more than the foreign language group. Even though there is a signal of students violating expected utility more often in the native language group, the differences between both groups are not significant. The hypothesis of Dutch students violating expected utility less when asking the betting question in a non-native language does therefore not find any statistical evidence. Previous literature studies have not yet tested the possible relationship between the common ratio

effect and language types. This study however does not find a significant relationship between both.

4.3 Ambiguity aversion

In order to test for ambiguity aversion, students were told to imagine two urns. The variables *RedUrn*, *BlueUrn* and *AmbigTrue* measure how much the students exhibited ambiguity aversion. These all have a value of either 0 or 1. *RedUrn* shows the amount of times people were ambiguity averse when they had to draw a red marble out of one of the urns. This is given the value 0 when a person picked the unknown urn and a value of 1 when the person chose the known urn (exhibited ambiguity aversion). *BlueUrn* is constructed the same, but students are asked to draw a blue marble. Students that remained ambiguity averse throughout both decisions are classified as 'truly ambiguity averse' and get a value of 1 assigned to them through *AmbigTrue*. If they opted to be ambiguity seeking in either of the urn questions, the value of *AmbigTrue* will be 0.

Table 4. Ambiguity Aversion results

VARIABLES	CHOICES	LANGUAGE TYPE		EXACT FISHER	PHI COEFFICIENT
		Foreign	Native		
		Count	Count		
REDURN	0	15	16	0,656	-0,059
	1	30	25		
BLUEURN	0	19	14	0,509	0,083
	1	26	27		
TRUEAMBIG	0	20	16	0,665	0,055
	1	25	25		

A total of 30 out of 45 (foreign group) and 25 out of 41 (native group) students were ambiguity averse regarding the question of drawing a red marble (Table 4). This aversion still persisted mainly when asked to draw a blue marble instead. 26 out of 45 (foreign group) and 27 out of 41 (native group) were ambiguity averse in the second part of the urn question. The Exact Fisher values for *RedUrn* (p=,656) and *BlueUrn* (p=,509) were both insignificant. Interesting to note is that the phi values of both variables have a different sign. The phi value

of the *RedUrn* is negatively associated with a change in language (phi=-0.059). In other words, switching from a foreign to native language increases the amount of people choosing the riskier urn. The native group was therefore relatively less ambiguity averse than the foreign group when asked to draw a red marble. Those who made the survey in English were indeed relatively more ambiguity averse and chose the known urn (choice 1) over the unknown urn (choice 0) more often than the native group. This preference however reversed on the second part of the question. The phi coefficient for the *BlueUrn* is positive (phi=0.083). In that case switching from a foreign language to the native one actually made the native language students become more ambiguity averse. The amount of students exhibiting ambiguity seeking behavior was bigger for the foreign group on the second part of the question. However, once again there were no significant differences among both groups.

25 out of 45 (Foreign group) and 25 out of 41 (Native group) students stayed ambiguity averse under both questions. These groups were dubbed to be 'truly ambiguity averse'. While there are some small differences between both groups when looking at the *AmbigTrue* variable, it is not statistically significant (p=,665). The positive value of the phi coefficient (0.055) implies that a change from foreign to native language is associated with a higher amount of students expressing 'true ambiguity'. The students making the survey in the native language were therefore relatively more ambiguity averse than the group that made the survey in the non-native language. The hypothesis of this thesis that students express less ambiguity aversion in a non-native language is only found under the *RedUrn* and *TrueAmbig* variable. An opposite effect is found under the *BlueUrn* question, those in a non-native language actually exhibited more ambiguity aversion. However, the exact fisher values of all three variables were highly insignificant. It is therefore concluded that there is no statistical significant different ambiguity aversion among native and non-native language type students.The previous literature studies do not go in deeply on the relationship between ambiguity aversion and the role of language. This thesis therefore hoped to shed a light on this topic.

One point of notice: While most students were ambiguity averse, there was also a vast amount that was ambiguity seeking. Students tended to stay at their first decision. Those that picked the known urn at the first question also preferred the same urn at the second question. Same goes for the students that picked the unknown urn first. They showed a

pattern of sticking with their first option. This might be due to them going through the survey as quick as possible, or because they genuinely are risk averse/seeking in numerous experiments. Language does not seem to promote an increase in ambiguity in the treatment group, as the differences in treatment and control group are not significant.

4.4 Moral questions

The switch example is called *Trolley1* and the example where you have to push a fat man of the bridge is called *Trolley2*. In each example there are two options:

1. Do nothing
2. Pull the switch/ push the man.

The first option is therefore always the non-utilitarian approach whereas the second option is utilitarian. *Trolley1* and *Trolley2* are therefore given the value 1 if a person chose the first option or a 2 if a person chose the second option. Finally, when people switched from a utilitarian approach to a non-utilitarian during the questions, they get a value of 1 in the variable *TrolleyViolations*.

Table 5. Trolley results

VARIABLES	CHOICES	LANGUAGE TYPE		EXACT FISHER	PHI COEFFICIENT
		Foreign	Native		
		Count	Count		
TROLLEY1	1	11	6	0,29	0,123
	2	34	35		
TROLLEY2	1	28	33	,095***	-0,201
	2	17	8		
TROLLEYVIOLATIONS	0	24	14	,086***	0,193
	1	21	27		

***** Significant under a 10% alpha**

Both groups seem to have relatively low problems with turning the switch in order to save the lives of multiple people (p=,290) (Table 5). 34 out of 45 (Foreign group) and 35 out of 41 (native group) students flipped the switch in order to save five lives. There was no real statistical evidence that the group in a native language behaved any differently from the

foreign group in the *Trolley1* question (p=0.29). The phi coefficient (0.123) of *Trolley1* did state that there was a positive association between language type and utilitarian decisions. The native group had a relatively higher amount of people who opted to pull the switch. By raising the emotional stakes in the decisions we do see something peculiar. Students that were given the option to push someone off a bridge in order to save the others were actually more ready to go through with it in the foreign language survey. 17 students in the foreign group were prepared to choose the utilitarian moral heavy decision. The native group on the other hand had a total of 8 students that decided to push the man off the bridge. Language does seem to play a role in emotional decisions that humans make. A person is arguably less emotionally attached to flipping a switch in order to five people, than pushing someone off a bridge. This requires a lot of emotional effort as it can make someone feel either guilty or immoral. Turning a switch can however be rationalized easier and could therefore summon less emotions with the student.

As mentioned earlier, the first option is that you decide to do nothing (non-utilitarian approach). Changing the language from a foreign to a native language actually made it more likely for a person to pick the first option under the *Trolley2* example. Students would not push the man as often when the question was asked in their native language (p=,095). This is also shown by the negative phi coefficient value (phi= -,201). This coefficient tells us the measure of association between two different nominal variables. Switching language from foreign to native reduces the amount of times a person picks the second option, which is the utilitarian one.

Language also affected the amount of times a student switched his decisions. Students who made the survey in a foreign language stayed with their choices relatively more often. Based on the *TrolleyViolation* variable 21 out of 45 students (Foreign group) and 27 out of 41 students (Native group) made an inconsistent decision. This result was statistically significant (p=0.086). If they decided to pull the switch in one example, they also were more likely to push the man off the bridge. There is a positive phi coefficient relationship showing that changing the language from foreign to native made people become inconsistent more often in their native language (phi=0,193). Language type influences the choices made during emotional heavy questions. Dutch students indeed took a more utilitarian approach to decisions when the question was presented in a non-native language. This confirms one of

the major sub hypotheses constructed at the beginning of the thesis. It also matches the previous literature results done by Costa et al (2014). A non-native language caused students to pick the more utilitarian option in their study while testing for a variety of different languages. Their results were however significant under an alpha of 1% whereas the results in this thesis are only borderline significant under a 10% alpha. This could be an indicator that the effect of language might be less for Dutch students. One of the possible explanations for the less significant results is due to the fact that the sample size is a lot smaller than the previous literature. Another possible explanation is the higher proficiency of English among Dutch students. English was used as the non-native language in both this study and the studies done by Costa et al (2014). To test for the importance of proficiency a probit regression was used on all four different major questions again.

4.5 Probit regression

4.5.1 Averages

In order to test for relationships between violations and the CRT and objective English proficiency scores, a Probit model is implemented. The results on the three questions asked in order to test ones cognitive skills were used to construct the *CRTScore* variable. This variable has a value between 0 and 3. If a student failed each question then the variable takes the value of 0, and with each right question the variable rises in value by 1. The maximum value is 3 in case each question was answered right. The objective English proficiency results were transformed into a variable as well: *OBJScore*. The idea is the same as the *CRTScore*, although it takes a value between 0 and 5. For each correct answer the value of the variable rises with 1 every time. The subjective proficiency ratings from each survey will be used to construct the following variables: *Speaking*, *Understanding*, *Reading* & *Accent.* These all have a value between 0 and 10, apart from the *Accent* variable. The higher a value someone attached to the questions, the more proficient they believe they are in the skill. *Accent* has a value between 0 and 100, 0 being no accent and 100 being a very thick accent.

The variables *Age*, *Gender*, *CurrentOccupation* and *Education* will be tested for significance through the probit model as well. *Age* is a variable that tells how old the respondent was. *Gender* has either the value of 1 if the person is a male or 2 if the person is female. *CurrentOccupation* has a value of either 1,2,3 or 4. The value 1 means the person is a student, 2 means the person is working, 3 means he is unemployed and 4 tells us that the person is retired. Finally, *Education* gives information on the persons highest education: elementary school (1), Middle school (2), Highschool/University (3) Master(4), Phd. (5).

These variables are the independent variables in a probit regression model with *AsianViolation*, *BetViolation*, *TrueAmbig* and *TrolleyViolation* as dependent variables. Each of the four major questions was given their own separate probit regression and will each be separately discussed.

In order to find out what factored into students learning English the survey included some possible topics that helped the student in learning a new language. These factors were: Interacting with family, interacting with friends, Radio, Watching tv/internet, School/Language tapes and reading. As your native language is one you learn by both social interaction and school, it is interesting to find out at what makes one learn a non-native language. Before discussing the results of the probit regression model the averages of the *CRTscore*, *OBJScore* and subjective ratings are given and briefly commented on.

Table 6. Averages objective and subjective variables

VARIABLES	AVERAGES
CRTSCORE	1,49
OBJSCORE	4,07
SPEAKING	7,64
UNDERSTANDING	8,01
READING	8,05
ACCENT	27,99

Dutch students seem to show signs of overconfidence, as they rate their English proficiency very high on average on numerous aspects (Table 6). It seems there might a better than average effect into play. However, students also have a high average rating on the objective score proficiency measure. This could be due to the fact that the measure only consisted of 5

questions and might be too basic to be a complete proxy to measure objective proficiency. The cognitive reflection test had a variety of different results. The average person therefore had between the 1 and 2 questions right. There was no real pattern to be found among the answers given by the students.

Table 7. Averages factors for learning a new language

FACTORS	AVERAGES
INTERACTING WITH FRIENDS	4,60
INTERACTING WITH FAMILY	3,80
READING BOOKS	6,26
LANGUAGE TAPES/SCHOOL	7,48
WATCHING TV	7,90
RADIO	5,76

Most students attached high values to language tapes, school, watching tv and internet. (Table 7). The averages for those values were a lot higher compared to the ratings for social interaction. This confirms the idea of Keysar et al (2012) that a foreign language could have less emotional resonance as it is learned through a more distant way. It also gives insight on the significant results found earlier in the trolley example. While the language type did not have any effects on the questions, it did on the emotional heavy one. There might indeed be some lack of emotional resonance when processing information from a non-native language.

4.5.2 AsianViolation

Table 8. Probit model: Dependent variable *Asianviolation*

DEPENDENT VARIABLE: ASIANVIOLATION	**COEFFICIENT**	**STD. ERROR**	**P-VALUE/SIG**	**MARGINAL EFFECTS (AME)**
CONSTANT	5.363439	2.576931	0.0374**	2.138756
LANGUAGE	0.761536	0.354422	0.0317**	0.303674
CRTSCORE	-0.294549	0.140094	0.0355**	-0.117456
OBJSCORE	-0.163002	0.174265	0.3496	-0.065000
READING	-0.256336	0.196105	0.1912	-0.102218
UNDERSTANDING	-0.343156	0.201403	0.0884***	-0.136839
SPEAKING	-0.146910	0.177710	0.4084	-0.058583
ACCENT	-0.028338	0.013958	0.0423**	-0.011300
AGE	-0.013072	0.046199	0.7772	-0.005213
GENDER	0.062215	0.335346	0.8528	0.024809
CURRENTOCCUPATION	-0.680980	0.469922	0.1473	-0.271552
EDUCATION	0.665869	0.353216	0.0594***	0.265526

**** Significant under a 5% alpha**

***** Significant under a 10% alpha**

As this is a probit model, the coefficients cannot be directly interpreted as with a linear regression model. However, the sign of the coefficient can. Language type is significant and positively related with whether an individual violated the Asian disease question or not (p=0.0317) (Table 8). By switching from a foreign (= value of 1) to a native (= value of 2) language, the probability on violating the question increases. In order to interpret the coefficients, the average marginal effects have been calculated. These effects show that switching from a foreign to a native language type questionnaire made it ≈30.36% more likely to violate the Asian Disease problem. This is a huge significant and surprisingly strong effect. This result implies that students reading the question in the native language were more likely to be influenced by framing.

The *OBJScore* (p=0.3496) and *CRTScore* (p=0.0355) variables on the other hand had a negative relationship with the dependent variable. A higher score on these tests was associated with a reduction in the probability of making a violation. The marginal effects of both scores were -0.1174 and -0.065. A one unit improvement on the CRT score would therefore lower the probability of violating the Asian disease problem with ≈11.74%. Likewise, a one unit increase in the value of the objective proficiency variable would lower the probabilities of a violation of the problem with ≈6.5%. It does not come as a surprise that

higher cognitive and objective scores are related to a lower probability in violating the Asian Disease. The subjects with high scores on these variables might have understood the questions better and were less susceptible to the framing.

The subjective scores all show a similar negative sign on their respective coefficients. *Reading* (p=0.1912) and *Speaking* (0.4084) were both insignificant. Raising the subjective rating on ones questionnaire by one would lead to a reduction in the probability of violating the disease by respectively ≈10.22 (for the variable *Reading*) and ≈5.86 (for the variable *Speaking*). *Understanding* (0.0884) and *Accent* (0.0423) had significant values attached to them. Subjects who increase their subjective ratings in these variables would respectively lower the probability of the Asian Disease violation with 13.68% and 1.13%. One thing to notice is that these values are relatively high. For example, if someone rated themselves a 4 for understanding English, they could decrease the probability of violating the Asian Disease a lot by changing it to something like an 8 or 9. However, most students were on the upper half of rating themselves to start with. Most students fell in between a 6-9 range of subjective English proficiency. Therefore, while these results are implied over one unit increases, it is rare to see someone rate themselves extremely low.

Finally, the demographic variables give various different results. *Age* (p=0.7772) and *CurrentOccupation* (0.1473) have a negative sign on the coefficient. The marginal effects state that by increasing the age by 1 the probability of violating the Asian disease lowers by 0.52%. Older students were therefore less likely to violate the Asian Disease problem. Switching from one form of occupation to the other reduces the probability of being inconsistent during the questionnaire with 27.15%. Education (p=0.0594) and *Gender* (0.8528) have a positive relationship with the dependent variable and therefore increase the likelihood of there being a violation. The variable *Gender* is insignificant and the marginal effect states that switching the gender from male to female would raise the probability of the variable *AsianViolation* with 2.48%. By raising the variable *Education* by one the likelihood of there being a violation significantly increased with 26.55%.

4.5.3 BetViolation

Table 9 Probit model: Dependent variable *BetViolation*

DEPENDENT VARIABLE: BETVIOLATION	**COEFFICIENT**	**STD. ERROR**	**P-VALUE/SIG**	**MARGINAL EFFECTS (AME)**
CONSTANT	-2.188455	2.548475	0.3905	-0.872621
LANGUAGE	0.372178	0.327441	0.2557	0.148402
CRTSCORE	0.221060	0.133926	0.0988***	0.088145
OBJSCORE	-0.000998	0.163683	0.9951	-0.000398
READING	0.194866	0.184438	0.2907	0.077701
UNDERSTANDING	-0.013214	0.198588	0.9469	-0.005269
SPEAKING	0.078728	0.166538	0.6364	0.031392
ACCENT	-0.007996	0.012933	0.5364	-0.003188
AGE	0.053182	0.051600	0.3027	0.021206
GENDER	-0.278968	0.323673	0.3888	-0.111235
CURRENTOCCUPATION	0.277119	0.433660	0.5228	0.110498
EDUCATION	-0.503092	0.347458	0.1476	-0.200602

***** Significant under a 10% alpha**

The same model is used, but this time with the *BetViolation* variable (Table 9). The Language type is insignificant but it is still positively related with whether an individual violated the Asian disease question or not (p=0.2557). By switching from a foreign (= value of 1) to a native (= value of 2) language, the probability of making a violation on the bet increases. Going from a foreign to a native language type questionnaire made it ≈14.84% more likely to violate the betting problem. This also means that subjects could have been more susceptible to either the certainty effect or the common ratio effect if they read it in their native language. The *OBJScore* (p=0.9951) and *CRTScore* (p=0.0988) variables have different relationships with the variable this time. The *CRTscore* is the only coefficient that is significant in the model and has a positive relationship with the betting violation question. Raising the CRT score by one unit increases the probability of violating the bet by ≈8.81%. This is a surprising result as one might have thought that high cognitive prowess would lead to less mistakes. *OBJScore* has a very low marginal effect of -0.03%. A higher score on the objective English Proficiency test would lower the probability of the *BetViolation* with 0.03%.

The subjective ratings were divided as well. *Reading* (p=0.2907) and *Speaking* (p=.6364) both have a positive sign on the coefficient whereas *Understanding* (p=0.9469) and *Accent* (p=0.5364) have a negative sign. Raising the subjective rating on ones questionnaire by one would lead to an increase in the probability of violating the bets by respectively ≈7.77% (for

the variable *Reading*) and ≈3.13% (for the variable *Speaking*). Raising the value of *Understanding* and *Accent* by one would lower the probability of making a bet violation with respectively 0.5% and 0.3%. High subjective ratings therefore mainly led to a increase in violations of the betting problem. *Understanding* and *Accent* do lower the problem, but their marginal effects are a lot smaller than the variables *Reading* and *Speaking*.

The demographic variables give different results once again. *Age* (p=0.3027) and *CurrentOccupation* (0.5228) have a positive sign on the coefficient. Increasing the age by 1 increases the probability of violating the betting problem by 2.12%. Switching from one form of occupation to the other increases the probability of switching during bets in the questionnaire with 11.04%. *Education* (p=0.1476) and *Gender* (0.3888) have a negative relationship with the dependent variable and therefore decrease the likelihood of there being a violation. The marginal effect of *Gender* states that switching the gender from male to female would lower the probability of the variable *BetViolation* with 11.12%. *Education* on the other hand shows that raising the education level decreases the likelihood of there being a violation with 20.06%.

4.5.4 TrueAmbig

Table 10 Probit model: Dependent variable *TrueAmbig*

DEPENDENT VARIABLE: TRUEAMBIG	**COEFFICIENT**	**STD. ERROR**	**P-VALUE/SIG**	**MARGINAL EFFECTS (AME)**
CONSTANT	1.611049	2.559725	0.5291	0.626638
LANGUAGE	0.063294	0.330832	0.8483	0.024619
CRTSCORE	-0.022871	0.134654	0.8651	-0.008896
OBJSCORE	-0.044566	0.169704	0.7928	-0.017335
READING	0.231782	0.188071	0.2178	0.090155
UNDERSTANDING	0.059487	0.198289	0.7642	0.023138
SPEAKING	-0.086349	0.172627	0.6169	-0.033587
ACCENT	-0.005103	0.013058	0.6960	-0.001985
AGE	-0.063457	0.044428	0.1532	-0.024682
GENDER	-0.005481	0.328664	0.9867	-0.002132
CURRENTOCCUPATION	0.623206	0.434498	0.1515	0.242404
EDUCATION	-0.577306	0.330417	0.0806***	-0.224551

***Significant under a 10% alpha

A probit model is also used for the *TrueAmbig* variable (Table 10). The *Language* (p=0.8483) type is once again insignificant, although the coefficient itself has a positive sign. The probability of 'true ambiguity' increases by changing the language type from foreign to

native with ≈2.46%.Those who made the survey in their native language were therefore more ambiguity averse than their non-native counterparts. The *OBJScore* (p=0.7928) and *CRTScore* (p=0.8651) variables are both negatively related with the *TrueAmbig* variable. Raising the CRT score by one unit decreases the probability of the true ambiguity aversion by ≈0.88%. *OBJScore* has a similarly low marginal effect of -0.017. A higher score on the objective English Proficiency test would lower the probability of a person exhibiting ambiguity over the urnquestions with 1.7%. Those with higher cognitive prowess or objective English proficiency were relatively more ambiguity seeking.

The subjective ratings were divided once again. *Reading* (p=0.2178) and *Understanding* (p=.7642) both have a positive sign on the coefficient whereas *Speaking* (p=0.6169) and *Accent* (p=0.6960) have a negative coefficient sign. Raising the subjective rating on ones questionnaire by one would lead to an increase in the ambiguity aversion by respectively ≈9.01% (for the variable *Reading*) and ≈2.31% (for the variable *Understanding*). Raising the value of *Speaking* and *Accent* by one would lower the probability of the *TrueAmbig* variable with respectively 3.35% and 0.19%.

The demographic variables have mainly negative values for the coefficients. *Age* (p=0.1532), *Gender* (p=0.9867) and *Education* (p=0.0806) have a negative sign on the coefficient. Increasing the age by 1 decreases the probability of true ambiguity by 2.46%. *Education* and *Gender* have a negative relationship with the dependent variable and therefore decrease the likelihood of there being an ambiguity aversion under respondents. The marginal effect of *Gender* states that switching the gender from male to female would lower the probability of the variable *TrueAmbig* with 0.21%. An increase in *Education* led to a decrease in the likelihood of there being ambiguity by 22.45%. This is also the only significant variable from the model. Those with higher educations therefore showed relatively more ambiguity seeking behavior. *CurrentOccupation* (p=0.1515) has a positive sign with the dependent variable and a marginal effect of 0.2424. This effect tells us that a subject who switches from one occupation to another (i.e. from student to working) raises the probability of the *TrueAmbig* having a value of 1 with 24.24%. In other words, someone who went from being a student to working would be more ambiguity averse.

4.5.5 TrolleyViolation

Table 11 Probit model: Dependent variable *TrolleyViolation*

DEPENDENT VARIABLE: TROLLEYVIOLATION	**COEFFICIENT**	**STD. ERROR**	**P-VALUE/SIG**	**MARGINAL EFFECTS (AME)**
CONSTANT	-2.959389	2.552287	0.2463	-1.165.060
LANGUAGE	0.450270	0.330645	0.1733	0.177263
CRTSCORE	-0.012924	0.132176	0.9221	-0.005088
OBJSCORE	-0.102810	0.174576	0.5559	-0.040474
READING	0.408578	0.190976	0.0324**	0.160850
UNDERSTANDING	0.006588	0.194774	0.9730	0.002593
SPEAKING	0.004910	0.169266	0.9769	0.001933
ACCENT	0.006732	0.013500	0.6180	0.002650
AGE	-0.053804	0.045469	0.2367	-0.021182
GENDER	-0.057326	0.323423	0.8593	-0.022568
CURRENTOCCUPATION	0.724152	0.460268	0.1156	0.285086
EDUCATION	-0.053599	0.333038	0.8721	-0.021101

****Significant under a 5% alpha**

A probit model is also used for the *TrolleyViolation* variable (Table 11). The *Language* (p=0.1733) type is insignificant, while the coefficient has a positive sign. The probability of being inconsistent with the trolley questions increases by changing the language type from foreign to native with ≈17.72%. Although it is not significant in the probit model, language type has a relatively high marginal effect. Students that read the questions in Dutch were less consistent with their decisions on the trolley examples. They would switch from a utilitarian to a non-utilitarian decision more often than the non-native group. The *OBJScore* (p=0.5559) and *CRTScore* (p=0.9221) variables are both negatively related with probability of a trolley violation. Raising the CRT score by one unit decreases the probability of someone violating the trolley question by ≈0.50 %. A higher score on the objective English Proficiency test lowers the probability of a person exhibiting a switch in their utilitarian preferences with 4.04%. Higher cognitive skills and English proficiency would lead to less mistakes/violations on the trolley question.

The signs of all subjective ratings were positive. *Reading* (p=0.0324) is significant and has a high coefficient value attached to it. *Understanding* (p=0.9730), *Speaking* (p=0.9769) and *Accent* (p=0.6180) were all insignificant and had minimal coefficient values on them. Raising the subjective rating on ones questionnaire by one would lead to an increase in the

probability of violation the trolley question by respectively ≈16.08% (for the variable *Reading*) and ≈0.25% (for the variable *Understanding*). Raising the values of *Speaking* and *Accent* by one would raise the probability of the TrolleyViolation variable with respectively 0.19% and 0.26%. High ratings on the subjective English proficiency would lead to relative more violations on the trolley question example. This is the direct opposite relationship the objective score measure has with the dependent variable.

The demographic variables have mainly negative values for the coefficients. Just like in the previous regression the variables *Age* (p=0.2367), *Gender* (p=0.8593) and *Education* (p=0.8721) have a negative sign on the coefficient. Increasing the age by 1 decreases the probability of a trolley violation by 2.11%. The marginal effect of *Gender* means that a switch in the gender from male to female would lower the probability of the variable *TrolleyViolation* with 2.22%. Females were therefore less prone to the trolley violation. *Education* shows that raising the education level decreases the likelihood of people switching preferences in the trolley questions with 2.11%. *CurrentOccupation* (p=0.1156) has a positive sign with the dependent variable and a marginal effect of 0.2850. This effect tells us that a subject who switches from one occupation to another (i.e. from student to working) raises the probability of the *TrolleyViolation* having a value of 1 with 28.50%.

5. Conclusions

This thesis tried to increase the ever vast amount of literature on behavioural economics. Not only does this study give an insight on classical experiments, it also looks at the relevancy of them in Dutch society. Dutch students are indeed prone to effects of framing and ambiguity aversion. However, the main research question was whether a change in language leads to students making more rational decisions. By reading something in a foreign language the mind might have to use more effort to fully understand what the question means. A survey testing for violations of expected utility was implemented to test for rationality between subjects.

The main finding of the research is that the language type does not lead to subjects behaving more rationally. While other previous researchers found highly significant results, this thesis fails to replicate the findings for the Dutch population. Classic examples of the Asian Disease problem were answered similarly by both the foreign and native language group. Testing for violations of expected utility through betting questions gave similar results. While subjects do violate expected utility and are not always rational, language type did not make a significant difference on the decisions made. Ambiguity aversion did not increase either with a change in language type. The only influence a change in language type had was during emotional heavy questions. Students take a more utilitarian approach to moral heavy questions when this is asked in a non-native language.

In order to expand the research, other variables that could have a link with the questions were regressed through a probit model. The CRT score and subjective ratings for *Understanding* and *Accent* lead to a lower probability of students violating the Asian Disease question, whereas *Education* raised this probability. Raising the CRT score was also significantly related to a higher likelihood in betting violations. *Education* on the other hand raised the amount of true ambiguity a student had in the survey. Finally, the subjective variable *Reading* had a positive significant relationship with the *TrolleyViolation* dependent variable. Raising the subjective *Reading* rating by one unit would lead to raising the probability of committing a trolley violation.

6. Limitations and Recommendations

Of course this research is not perfect. There are a few limitations and recommendations in order to expand the study. Firstly, there were no incentives in the experiment. Mental costs might have been too high for a person to fully put in their optimal amount of effort. In order to combat this, some cognitive questions were added to test for students understanding of the survey. If they were filling in random choices at the beginning of the questionnaire, then this could have led to a lower score on the CRT and objective English questions. This was not the case as CRT and English proficiency were not always significantly related to alterations of choices in the sample. Nonetheless, adding incentives can make the survey a true economic experiment as it has been shown in the past that the right monetary incentives can lead to a higher effort students put in an experiment.

Secondly, this survey combated multiple types of classical economic experiments. On the other hand, Keysar et al (2012) made their experiments focus on one aspect at a time. Perhaps delving into one aspect of decision-making and expanding the English proficiency tests could lead to a more representative view of the topics. This survey on the other hand tried to get an idea of how Dutch students behave towards numerous classical economic examples.

Finally, this study was done through an online questionnaire where subjects made it in their own free time. There was no way for the researcher to make sure that every student was exposed to the same types of environment. It is unsure if someone made the survey on his or her own as they could have had company or visitors. Perhaps they filled in the questionnaire with loud music on, or with family and friends next to them. It is hard as a researcher to control for all these things, unless the survey was done in an isolated environment. On the other hand, the results in this research are more externally valid compared to a regular lab experiment.

All in all this research tried to capture the significance of language and decision-making. While Dutch students do not change their behavior as much as students in other countries, they do so with moral questions. Framing and violations of expected utility do not seem to alter due to the language type for Dutch students. With the upcoming rise of neuroscientific research, researchers can possibly expand on the literature available on behavior and moral.

7. References

Alter, A. L., Oppenheimer, D. M., Epley, N., & Eyre, R. N. (2007). Overcoming intuition: metacognitive difficulty activates analytic reasoning. *Journal of Experimental Psychology: General,* 136(4), 569.

Angie, A. D., Connelly, S., Waples, E. P., & Kligyte, V. (2011). The influence of discrete emotions on judgement and decision-making: A meta-analytic review. *Cognition & Emotion*, *25*(8), 1393-1422.

Arlo-Costa, H., & Helzner, J. (2005). Comparative ignorance and the Ellsberg phenomenon. *Carnegie Mellon University*

Ayçiçeği, A., & Harris, C. L. (2004). Bilinguals' recall and recognition of emotion words. *Cognition & Emotion, Vol 18*, pp.977–987.

Bechara, A. (2004). The role of emotion in decision-making: evidence from neurological patients with orbitofrontal damage. *Brain and cognition*, *55*(1), 30-40.

Bechara, A., Damasio, H., & Damasio, A. R. (2000). Emotion, decision making and the orbitofrontal cortex. *Cerebral cortex*, *10*(3), 295-307.

Bechara, A., Damasio, A. R., Damasio, H., & Anderson, S. W. (1994). Insensitivity to future consequences following damage to human prefrontal cortex. *Cognition*, *50*(1), 7-15.

Cerreia-Vioglio, S., Dillenberger, D., & Ortoleva, P. (2013). Cautious expected utility and the certainty effect. *PIER Working Paper No. 13-037; Columbia Business School Research Paper No.* 13-52.

Chen, N., Rau, P. P. L., & Yao, N. T. (2014, September). The influence of Chinese-Western Bilingualism on Rationality in Decision Making Behavior. *Proceedings of the Human Factors and Ergonomics Society Annual Meeting (Vol. 58, No. 1*, pp. 375-379). SAGE Publications.

Chen, S. X., & Bond, M. H. (2010). Two languages, two personalities? Examining language effects on the expression of personality in a bilingual context. *Personality and Social Psychology Bulletin*, *36*(11), 1514-1528.

Costa, A., Foucart, A., Hayakawa, S., Aparici, M., Apesteguia, J., Heafner, J., & Keysar, B. (2014). Your morals depend on language. *PLoS ONE 9(4): e94842. doi:10.1371/journal.pone.0094842*

Damasio, A. (2008)[1994]. *Descartes' error: Emotion, reason and the human brain*. Random House.

De Martino, B., Kumaran, D., Seymour, B., & Dolan, R. J. (2006). Frames, biases, and rational decision-making in the human brain. *Science*, *313*(5787), 684-687.

DeJoy, D. M. (1989). The optimism bias and traffic accident risk perception. *Accident Analysis & Prevention*, *21*(4), 333-340.

Ellsberg, D. (1961). Risk, ambiguity, and the Savage axioms. *The quarterly journal of economics*, 643-669.

ESL-Lounge (2013), Cambridge Certificate of Proficiency in English (CPE) Test Prep Exercises. Retrieved from: http://www.esl-lounge.com/student/proficiency.php

Fishburn, P. C. (1981). Subjective expected utility: A review of normative theories. *Theory and Decision*, *13*(2), 139-199.

P. Foot (1967) [1978] , The Problem of Abortion and the Doctrine of the Double Effect, *Virtues and Vices and other Essays in Moral Philosophy 19*

Fox, C. R., & Tversky, A. (1995). Ambiguity aversion and comparative ignorance. *The quarterly journal of economics*, 585-603.

Fox, C. R., & Weber, M. (2002). Ambiguity aversion, comparative ignorance, and decision context. *Organizational Behavior and Human Decision Processes*, *88*(1), 476-498.

Frankish, K., & Evans, J. S. B. T. (2009). The duality of mind: an historical perspective. *In two minds: Dual processes and beyond*, 1-29.

Frederick, S. (2005). Cognitive reflection and decision making. *Journal of Economic perspectives*, 25-42.

Friedman, M., & Savage, L. J. (1952). The expected-utility hypothesis and the measurability of utility. *The Journal of Political Economy*, 463-474.

Frijda, N. H., Manstead, A. S., & Bem, S. (2000). The influence of emotions on beliefs. *Emotions and beliefs: How feelings influence thoughts*, 1-9.

Frydman, C., Barberis, N., Camerer, C., Bossaerts, P., & Rangel, A. (2011). Testing theories of investor behavior using neural data. *SSRN eLibrary*.

Heath, C., & Tversky, A. (1991). Preference and belief: Ambiguity and competence in choice under uncertainty. *Journal of risk and uncertainty*, *4*(1), 5-28.

Kahneman, D (2003). "A perspective on judgement and choice". *American Psychologist* 58: 697–720

Kahneman, D., & Tversky, A. (1979). Prospect theory: An analysis of decision under risk. *Econometrica, Vol. 47*, pp.263–291.

Keren, G., & Gerritsen, L. E. (1999). On the robustness and possible accounts of ambiguity aversion. *Acta Psychologica*, *103*(1), 149-172.

Keysar, B., Hayakawa, S. L., & An, S. G. (2012). The foreign-language effect thinking in a foreign tongue reduces decision biases. *Psychological Science*, *23*(6), 661-668.

Litvak, P. M., Lerner, J. S., Tiedens, L. Z., & Shonk, K. (2010). Fuel in the fire: How anger impacts judgment and decision-making. In *International handbook of anger* (pp. 287-310). Springer New York.

Loomes, Graham, Chris Starmer, and Robert Sugden. "Observing violations of transitivity by experimental methods." *Econometrica: Journal of the Econometric Society* (1991): 425-439.

Loomes, G., & Sugden, R. (1982). Regret theory: An alternative theory of rational choice under uncertainty. *The economic journal*, 805-824.

Loewenstein, G., & Lerner, J.S. (2003). The role of affect in decision making. In R. Davidson, K. Scherer, & H. Goldsmith (Eds.), Handbook of affective science, pp. 619-642. New York: Oxford University Press

Matz, D. C., & Wood, W. (2005). Cognitive dissonance in groups: the consequences of disagreement. *Journal of personality and social psychology*, *88*(1), 22.

Moore, D. A., & Healy, P. J. (2008). The trouble with overconfidence. *Psychological review*, *115*(2), 502.

Naqvi, N., Shiv, B., & Bechara, A. (2006). The role of emotion in decision making a cognitive neuroscience perspective. *Current Directions in Psychological Science*, *15*(5), 260-264.

Neumann,von, J. and Morgenstern, O.(1947), Theory of Games and Economic Behavior. *Princeton, NJ. Princeton University Press*

Odean T. (1998) “Are investors reluctant to realize their losses?” *The Journal of Finance*, 53(5): 1775-1798

Pavlenko, A. (2005). Emotions and multilingualism. *New York, NY: Cambridge University Press*.

Schoemaker, P. J. (1982). The expected utility model: Its variants, purposes, evidence and limitations. *Journal of economic literature*, 529-563.

Schwarz, N., Strack, F., Hilton, D., & Naderer, G. (1991). Base rates, representativeness, and the logic of conversation: The contextual relevance of “irrelevant” information. *Social Cognition*, *9*(1), 67-84.

Slovic, P., Finucane, M. L., Peters, E., & MacGregor, D. G. (2004). Risk as analysis and risk as feelings: Some thoughts about affect, reason, risk, and rationality. *Risk analysis*, *24*(2), 311-322.

Starcke, K., Polzer, C., Wolf, O. T., & Brand, M. (2011). Does stress alter everyday moral decision-making?. *Psychoneuroendocrinology*, 36(2), 210-219. doi:10.1016/j.psyneuen.2010.07.010 Retrieved on 10/4/12

Starmer, C., & Sugden, R. (1989). Violations of the independence axion in common ratio problems: An experimental test of some competing hypotheses. *Annals of Operations Research*, *19*(1), 79-102.

Thaler, R. (1985). Mental accounting and consumer choice. *Marketing science*, *4*(3), 199-214.

Thomson, J. J. (1976). Killing, letting die, and the trolley problem. *The Monist*,*59*(2), 204-217.

Trafimow, D., Silverman, E. S., Fan, R. M. T., & Law, J. S. F. (1997). The effects of language and priming on the relative accessibility of the private self and the collective self. *Journal of Cross-Cultural Psychology*, *28*(1), 107-123.

Tversky, A.& Kahneman, D. (1974), "Judgments Under Uncertainty: Heuristics and Biases" *Science* 185 (4157): 1124–1131

Tversky, A., & Kahneman, D. (1981). The framing of decisions and the psychology of choice. *Science*, *211*(4481), 453-458.

Tversky, A., & Kahneman, D. (1986). Rational choice and the framing of decisions. *Journal of business*, S251-S278.

Thaler, R. H. (1981). "Some Empirical Evidence on Dynamic Inconsistency". *Economic Letters* 8 (3): 201–207.

8.1 Appendix A – Questionnaire (example)

Hello and **Thank you** in advance for your help. This is a survey **only** for native Dutch speakers. You will be presented with a lot of different questions. You are free to pick what you prefer. This questionnaire will take you about 5-10 minutes.

Question 1.

Imagine that your country is preparing for the outbreak of an unusual Asian disease, which is expected to kill 600 people. Two alternative programs to combat the disease have been proposed, Program A and Program B. Assume that the exact scientific estimates of the consequences of the programs are as follows:

- If Program A is adopted, 200 people will be saved.
- If Program B is adopted, there is 1/3 probability that 600 people will be saved, and 2/3 probability that no people will be saved.

Which program would you choose to implement?

Question 2.

You will be presented with a few choices down below. Each time there are two options to choose from. You are asked to state which of the two you prefer over the other.

1. A. A sure gain of €30
   B. 80% chance to win €45 and 20% chance to win nothing

2. C. 65% chance to win €30 and 35% chance to win nothing
   D. 25% chance to win €45 and 75% chance to win nothing

3. E. 25% chance to win €30 and 75% chance to win nothing
   F. 20% chance to win €45 and 80% chance to win nothing

Question 3.

On a scale from **zero to ten**, please report your level of proficiency in speaking, understanding and reading **English:**

Language: English
Speaking:
Understanding Spoken language:
Reading:

Also, on a scale from **zero to ten**, please select how much the following factors contributed to you learning **English**:

Language: English	
Interacting with friends:	**Language tapes/ School**
Interacting with family	**Watching tv**
Reading	**Listening to the radio**

Finally, on a scale from 0 to 100, how much of an accent do you have when speaking English? (0 being no accent and 100 being a very thick accent).

Question 4.

There is a runaway trolley barreling down the railway tracks. Ahead, on the tracks, there are five people tied up and unable to move. The trolley is headed straight for them. You are standing some distance off in the train yard, next to a lever. If you pull this lever, the trolley will switch to a different set of tracks. However, you notice that there is one person on the side track. You have two options: (1) Do nothing, and the trolley kills the five people on the main track. (2) Pull the lever, diverting the trolley onto the side track where it will kill one person. Which is the correct choice?

Question 5.

If it takes 5 machines 5 minutes to make 5 products, how long would it take 100 machines to make 100 products?

Question 6.

Imagine being in a room with two large urns, Urn A and Urn B.

Each urn contains 100 marbles. The urns are both covered so you can't see inside them. However, you know that Urn A contains 50 blue marbles and 50 red marbles. Urn B also contains 100 marbles, but the ratio of red to blue marbles is unknown, and every ratio of red-blue is as likely.

6A. The game is to draw a **red** marble in one pick, without looking. If you succeed you win €100, if not you win nothing.

Which urn do you prefer drawing a marble from?

6B. Now recall the same situation, but in order to win you need to draw a **blue** marble without looking. If you succeed you win €100, if not you win nothing.

Which urn do you prefer drawing a marble from?

Question 7.

Recall the unusual disease question from earlier. An unusual disease is expected to kill 600 people, but this time the scientists propose to you a different variety of programs to choose from, Program C and Program D. Assume that the exact scientific estimates of the consequences of the programs are as follows.

- If Program C is adopted 400 people will die.
- If Program D is adopted there is 1/3 probability that nobody will die, and 2/3 probability that 600 people will die.

Which one would you choose to implement?

Question 8.

You will now be presented by a few sentences that are incomplete and are asked to fill in the blanks with the option you feel is most appropriate:

1. They spoke to their mother who _____ it clear she wasn't happy with their recent behaviour.

A. Makes
B. Make
C. Made
D. Is Making

2. There were thick, dark woods all _____the house and the family often felt as if they were on a boat in an ocean of trees

A. Under
B. Around
C. Over
D. In

3. If you want the painting, you will have to pay more than $4000. We have _____ lack of other offers so don't need to accept yours.

A. A
B. No
C. Multiple
D. None

4. She absolutely loves _____ when you sing to her like that. Look at her smiling!

A. That
B. Those
C. It
D. Them

5. That the workers feel angry I can understand perfectly well. _____ I can't understand is how they resort to violence.

A. However
B. But
C. What
D. Now

*** Source: *Esl-Lounge***

Question 9.

A baseball bat and a ball cost €1,10 in total. The bat costs €1,00 more than the ball. How much does the ball cost?

Question 10.

In a lake, there is a patch of lily pads. Every day, the patch doubles in size. If it takes 48 days for the patch to cover the entire lake, how long would it take for the patch to cover half the lake?

Question 11.

There is a runaway trolley barreling down the railway tracks. Ahead, on the tracks, there are five people tied up and unable to move. A trolley is hurtling down a track towards five people. You are on a bridge under which it will pass, and you can stop it by putting something very heavy in front of it. As it happens, there is a very fat man next to you – your only way to stop the trolley is to push him over the bridge and onto the track, killing him to save the five people on the track.

Should you proceed?

Finally, a few demographic questions:

What is your age?

What is your gender?

What is your highest level of education?

What is the first language you learned?

What is your current occupation?

What/ which language(s) do you speak outside of Dutch?