Radboud Universiteit Nijmegen

# The influence of mood on the WTA-WTP gap

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# Table of abbreviations

| | |
|---|---|
| WTA | Willingness-to-accept |
| WTP | Willingness-to-purchase |
| US | United States |
| AIM | Affect infusion model |
| MMH | Mood maintenance hypothesis |
| MT | Amazon Mechanical Turk |
| PANAS | Positive and negative affect score |

# 1. Introduction

Two concepts which have been studied extensively in various types of context are the WTA and WTP of an individual. WTA stands for the minimum willingness-to-accept a certain transaction, usually a selling condition. In contrast, WTP concerns the purchasing condition and is abbreviated for maximum willingness-to-purchase. Directly connected to these two measures is the so-called endowment effect or WTA-WTP gap, in which a person's WTA exceeds the person's WTP for the same good. Researchers have been trying to find a suitable explanation for why this effect exists, as it should not for rational individuals. The traditional explanations such as different locations in an indifference curve simply do not hold for the disparity. There are many suggested theories aiming to answer this question dating back to the earliest mention of the effect. We will provide more detailed examples of common explanations in the course of this thesis, however central to our study are behavioral explanations and the interaction of mood on a person's WTA and WTP values. As Figure 1 evidences, research combining psychological factors and financial economics, so-called behavioral finance, has emerged much more recent in literature than references on the endowment effect.

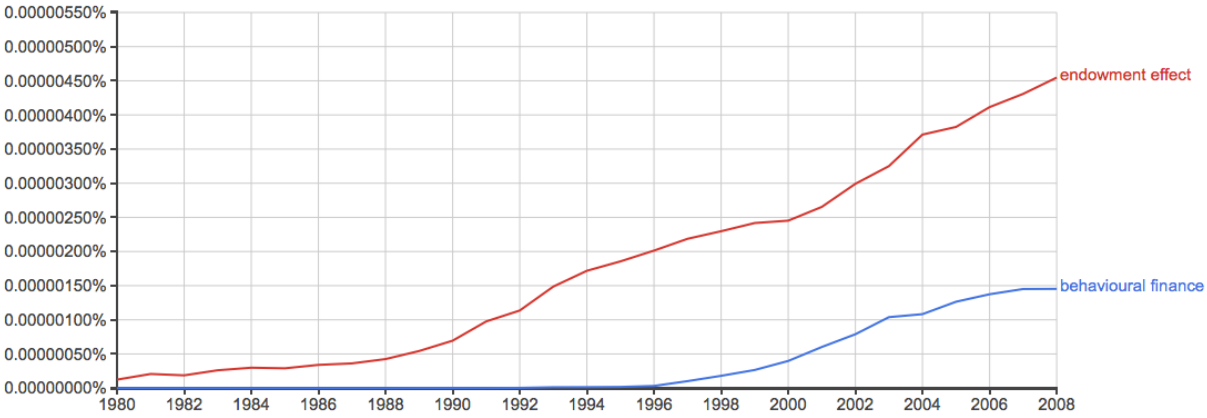



**Figure 1, Growth of behavioral finance and endowment effect mentions in literature (google, 2016)**

Behavioral finance has already yielded many interesting insights in several aspects of economics and challenged the previously dominating view of rational individuals or markets. While behavioral aspects haven been studied extensively in many fields of economics, the endowment effect has not yet received similar amounts of attention. It seems intuitive that an individual's mood should have an impact on his WTA and WTP values. We will contribute to a small number of existing mood and WTA-WTP gap studies, by determining whether mood has an influence on WTA or WTP, in which direction happiness or sadness influence prices and how these effects adjust the gap. To find answers for these research questions we conduct

several regression models on the determinants of WTA and WTP prices of our study subjects. The study consists of 150 US American participants who are asked to state their WTA and WTP prices for 5 goods while under a specific mood treatment. We use a novel approach of conducting behavioral finance research by fully relying on online study tools. Participants are recruited using crowdsourcing platforms and will conduct the whole survey in their browser over the internet. Further we will calculate WTA-WTP gap ratios for our sample covering several types of goods and compare them with previously observed values by other authors. This approach will allow us to identify differences in studies using mood induction and non-mood ones as well as to identify potential changes in WTA-WTP disparity research over time.

The thesis is constructed the following way: In Section 2 an overview of the WTA-WTP disparity, the influence of mood on WTA and WTP and experiments using crowdsourcing platforms including its relevant literature are presented. This section is followed by the description of the survey design and the resulting data thereof in Section 3 and Section 4 respectively. The main part of this thesis is found in Section 5. An empirical analysis is executed in three parts, first mood induction results from our survey participants are analyzed descriptively and empirically. Secondly, multivariate Tobit and truncated regression models are applied on the individual's WTA and WTP prices for all 5 survey goods. Applied regression models provide insight on the role of mood as well as the role of other background factors such as participants' gender on WTA and WTP prices. After the WTA and WTP determinants analysis, we compare our gap observations to previous literature. Eventually results are interpreted and summed up in the last part of the thesis, the conclusion.

# 2. Literature review

## 2.1. The WTA – WTP disparity

The measures of willingness-to-accept (WTA) and willingness-to-purchase (WTP) are one of the most widely documented phenomena in behavioral economics. To provide a brief explanation of their meaning, the WTA is a person's minimum price he is willing to accept in order to let go or give up a good. In contrast, the WTP can be understood as the maximum amount of money a person is willing to spend in order to receive a certain good. Goods can be any type of object, physical or abstract, holding some type of value to an individual. The most interesting part however is the interaction of these two measures also known as the WTA-WTP disparity or gap. Several mood neutral studies have found that people tend to set higher prices for selling (WTA) then for buying the identical object (WTP). This empirical finding played an important role in supporting reference-dependent models within economics and decision research, such as Prospect Theory by Kahneman and Tversky (1979, 1992) and the related reference-dependent model for riskless choice (Tversky and Kahneman, 1991). The disparity has been reproduced many times in the past in a variety of circumstances, see Horowitz and McConnell (2002) or Tuncel and Hammitt (2014) for extensive meta-analyses of previous studies. However, no clear explanation has been found to explain the determinants of the disparity. In fact, the gap has been criticized by many authors as consequence of mistakes made by inexperienced subjects see Knez et al. (1985) and List (2004, 2011), among others, or even as a result of inappropriate experimental design see Plott and Zeiler (2005, 2007). According to standard assumptions of economic theory there should be no disparity for goods with close substitutes as Hanemann (1991) argues in his critique of previous WTA-WTP studies. Common explanations for the gap include theoretical, psychological and experimental-design features. Theoretical explanations among other causes relate the gap to income effects and transaction costs see Randall and Stoll (1980). And more recently to commitment costs as Zhao and Kling (2004) argue. Psychological explanations rely on findings from behavioral economics such as framing (Thaler, 1980) and the endowment effect by Kahnemann et al. (1990) among other explanations. The two meta-analyses mentioned above (Horowitz and McConnell, 2002; Tuncel and Hammitt, 2014), provide an overview of experimental causes such as types of goods and elicitation techniques. The two central findings of Horowitz and McConnell (2002) are that experimental features don't influence the disparity significantly and secondly, that the farther a good is from being an ordinary private good the higher the observed gap between WTA and WTP. Their finding evidences that the

disparity does not simply arise due to inappropriate experimental design and that an economically useful response pattern exits. Building on these results, Tuncel and Hammitt (2014) conduct a new meta-analysis on a sample twice as large as the previous one. Their results confirm most of the earlier findings, with the most important one being the confirmation that the gap is not simply a result of weak experimental design and that the gap varies per type of good. Another interesting finding of theirs is that the ratio of WTA to WTP, a measure of the disparity, has significantly decreased over the years of its existence. They attribute this decrease to improvements in the design and conduct of stated-preference studies over the years. They also investigate the determinants of WTA and WTP prices and find that important factors influencing the disparity are, apart from the type of good, the subjects experience in valuing it. Even after more than 40 years of knowledge about the gap and numerous studies, the gap is still found today and no clear cause for its existence determined. We take the previous studies into account, especially focusing on the two meta-analyses, and add the role of subjects' mood to the already established experimental structures.

## 2.2. The influence of mood on WTA and WTP

An area which has not yet received much attention in behavioral economics, lies in the role of mood on the WTA-WTP gap. It seems highly likely that positive or negative mood states of the individual translate into behavioral deviations from the norm. Individuals' judgment is influenced in part by how they feel at the time of decision making. Early research on mood in the context of decision making found significant interactions. A famous study was conducted by Johnson and Tversky (1983) in which they found that newspaper reports had an effect on the completely unrelated perceived global risk of experimental subjects. They linked these changes in risk estimates to the affect induced through reading the newspaper. It shows that not only preferences of individuals are influenced by contextual factors such as mood, but further affect constitutes an important factor in decision making as Slovic et al. (2002) theorize.

The earliest authors to investigate the WTA-WTP disparity in the context of psychological factors are Lerner et al. (2004). They induce two different mood states, namely sadness and disgust, on their experimental subjects in order to compare and contrast each groups' WTA and WTP prices with a neutral control group. After successful mood induction by means of short videos, the authors find that sadness as compared to the neutral control group decreases WTA and increases WTP. This finding is surprising as it effectively reverses the generally

accepted disparity and endowment effect theory which has not been observed previously. A second study supporting Lerner et al. (2004) was conducted by Lin et al. (2006). In two experiments with over 400 participants they observe the disparity, of WTA exceeding WTP, only for participants induced to feel happy, but not for people induced to feel sadness. The finding is in line with the so-called affect regulation model by Larsen and Prizmic (2004), which states that sad individuals try to change their mood by giving up their current goods cheaper and buying new goods for higher prices. Through changing their circumstances, the individual hopes to better his mood. A more recent paper on negative mood by Martinez et al. (2011) builds on the above mentioned literature but focuses specifically on the emotions of regret and disappointment. They find that regret eliminates the gap, whereas disappointment reverses it, which confirms that the previous findings hold. Lahav and Meer (2012) set out to test the opposite effect. They induce a positive mood on subjects in a hypothetical asset bubble experiment. Their methodological approach is similar to Lerner et al. (2004). First they expose undergrad students to a short 5-minute comedy clip, followed by a mood induction check and finally the call market experiment. Their main finding is that prices deviate from fundamental values more under a positive mood treatment. Further they observe that both WTA and WTP are significantly higher for subjects in a positive mood than for mood neutral participants. Another study on the influence of positive mood on the gap is run by Georgantzis and Navarro-Martinez (2010). Their scope is broader than just researching the role of mood on the WTA-WTP disparity. In an experiment with bottles of wine they collect information on attitudes towards the good, feelings, uncertainty and subject's personality. For this thesis the most important finding of theirs is the observed increase in WTA for subjects in a happy mood. They argue that this increase in WTA creates the disparity in conjunction with loss aversion due to uncertainty about the good.

As this thesis will focus specifically on the influence of the three mood states: happiness, sadness and neutral mood, on the WTA and WTP prices it will be possible to test whether subjects behave according to the Affect Infusion Model (AIM) or Mood Maintenance Hypothesis (MMH). Previous research in the area of mood on risk taking has produced proof for both models which shows that there is still great demand for further studies. In a nutshell Forgas (1995) states in his AIM that positive mood should increase risk taking whereas negative mood decreases one's tendency to take risks. According to the model, individuals rely on positive cues in making judgments when in an elated mood, which in turn increases risk seeking. People in a negative mood are asserted to behave more carefully and

systematically in order to avoid potential losses. On the contrary, MMH by Isen and Patrick (1983) identifies risk seeking behavior in the negative mood because people try to actively change their mood. As the name of the model suggests, individuals in an elated mood are trying to maintain their current state by behaving risk averse. Lerner et al. (2004) and Lin et al. (2006) finding a reverse WTA-WTP gap correlates with the MMH model of risk seeking behavior in a negative mood. For Lahav and Meer (2012) it is not straight forward to determine which model their findings follow. Increased WTA and WTP prices in the positive mood could be identified as increased risk taking as the values deviate from the fundamentals. Increased risk taking in the positive mood would be attributed to the AIM model. It appears as if in the WTA-WTP domain both models could hold. This thesis will provide further insight on this debate. Furthermore, we will investigate this our observations in comparison to previous mood neutral studies.

## 2.3. Experiments using crowdsourcing platforms

A novel approach in conducting surveys is utilized in the context of WTA and WTP studies. There are a few advantages in recruiting participants online through crowdsourcing databases over using normal student respondents. The most important reason for choosing online recruitment tools is to avoid the commonly found narrow database criticism of using student participants see Sears (1986) and Henry (2008). Especially in the case of WTA and WTP it is important to conduct experiments on heterogeneous subjects to allow for realistic price elicitation. We set certain rules such as geographical restrictions to allow for common pricing experience of goods among participants and language skills. This will be detailed in chapter 3, survey design. Even though the emergence of online recruitment tools happened only recently, there are already numerous studies attesting to their validity. Buhrmester et al. (2011) find that data obtained online is at least as reliable as those obtained via traditional methods and Mason and Suri (2012) give an example of behavioral research conducted on Amazons Mechanical Turk (MT) platform. The use of MT for online experiments has been documented by Paolacci et al. (2010). According to their paper, workers in Mechanical Turk exhibit the classic characteristics, biases and pay attention to directions at least as much as subjects from traditional sources. Further they stress the cost savings, ease of recruitment and possible improvement of internal validity of experiments utilizing these platforms. The validity of online recruitment in experimental economics has been tested by Horton et al. (2011). The authors repeat three classic economics experiments and find robust results.

Similar to Buhrmester et al. (2011) they argue that experiments using these recruitment platforms have equal or even better external validity than traditional methods.

# 3. Survey design

The following paragraph will describe the survey setup and detail the choice of certain parameters. As mentioned in section 2.3, a novel approach to gathering data is used by conducting the survey fully online. Participants will be recruited through Crowdflower, which aggregates experimental participants from several online crowdsourcing platforms. Instead of relying on expensive study data with student participants, we benefit from a much cheaper and more diverse set of individuals on Crowdflower. It aggregates, among other platforms, Amazon's Mechanical Turk, which has been used in several studies lately. Unfortunately, it is not possible to use MT directly without Crowdflower as MT is only open to US citizens. Crowdflower doesn't have this restriction. In order to guarantee high quality answers, a set of rules and restrictions for participants are implemented. At first a geographical restriction on participants living in the United States is put in place, this ensures that all participants have proper understanding of the English language as well as to set a level pricing background for the survey. It follows that all participants should have similar experience with pricing certain goods and allows us to ignore any potential foreign currency or inflationary effects. An experiment covering several economical diverse countries could not be as easily interpreted due to highly varying prices for common goods, for example the price of a bottle of water in the United States versus one in India. Further the survey adheres to Crowdflower's quality guidelines which limits participation to individuals with the highest achievable task rank i.e. experience Level 3[1] participants. Another rule is that each participant gets a unique ID attached to them, which prohibits them from completing the survey more than once as well as act as a control mechanism to ensure only Crowdflower participants can take the survey. To attract participants, a compensation of $0.35 is paid for each completed survey with the option of earning another $0.15 in variable bonus depending on the number of video context questions answered correctly. After recruitment through Crowdflower, the participants are directed to the main survey. The survey itself is hosted on Radboud's Qualtrics Servers and can only be accessed through this link. For the layout of the experiment consult Figure 1 below.

[1] CrowdFlower performance level 3 participants have proven over time that they are trustworthy and meet specific criteria: Level 3 contributors are the highest performance contributors who account for 7% of monthly judgments and maintain the highest level of accuracy across a large spectrum of CrowdFlower jobs.

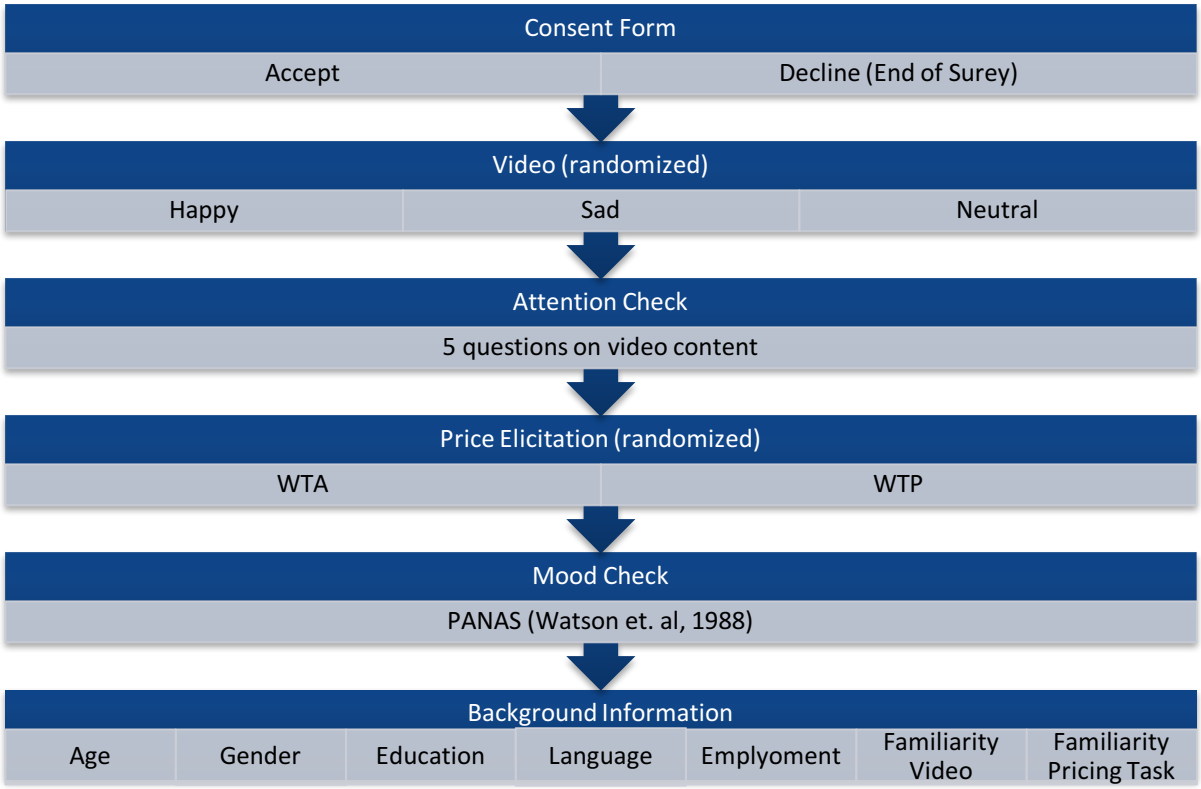



**Figure 2, Survey layout**

In a first step the participant is shown a consent form while the basic content of the survey is explained. Furthermore, the individual has to provide his Crowdflower ID in order to cross validate the participants and allow for bonus compensation. After his consent the real survey can start. Each participant is placed randomly into one of the three mood treatments: Sad, Happy, Neutral. Participants are not told the purpose of the survey nor the type of video they are shown, rather they are told that the survey consist of two separate tasks. By doing so we try to guarantee that our participants will act normally and avoid acting as if specific behavior is expected of them. A video is shown with the intent to induce the specific mood. Research has shown that most reliable mood induction procedure, e.g. experimenter demand effect, is by the means of short videos. Martin (1990), analyzing different mood induction methods, found that films successfully induce the required mood in more than 75% of cases, whereas other tools only achieved the induction with a 50% success rate. Further evidence for the reliability of films is attested by Westermann et al. (1996) and their meta-analyses of mood induction tools. A description of each video and link to the respective YouTube video is given in Table 1.

| Treatment | Title | Duration (minutes) | Link | Description |
|---|---|---|---|---|
| Happy | Miss Devine | 03:39 | https://www.youtube.com /watch?v=KQF79ch6mA8 | Two cousins recall funny ancedotes about their fearsome Sunday school teacher, Miss Lizzie Devine, the only woman who had more power than their grandmother. |
| Sad | John and Joe | 03:55 | https://www.youtube.com /watch?v=yfWa9gI-Bks | A father tells the story of his two sons who passed away in the aftermath of September 11, 2001, while responding to the call from the World Trade Center. |
| Neutral | Antarctica - National Geographic Traveler | 03:25 | https://www.youtube.com /watch?v=P6M5hw2eTWY | Travel documentary about growing numbers of tourists making their way to Antarctica. |

**Table 1, Overview of films**

Immediately following the video, participants are instructed to answer 5 questions regarding the content of the video in order to verify whether they paid attention or not. As mentioned above these questions are intended not only to ensure that the participants understood the video but mostly to incentive them to pay their full attention to the video, therefore ensuring a most effective mood induction. Again the participants are reminded that their performance in the video content check will determine their amount of bonus compensation. Purposefully participants should be able to answer these questions in less than 3 minutes which ensures that the mood effect still holds for the following WTA-WTP task. Next, participants will be randomly assigned with either the task of stating their maximum willingness-to-purchase price for an object or minimum willingness-to-accept price to trade an item they hypothetically own. In this section prices for 5 goods are elicited. The goods are chosen specifically to represent goods comparable to previous studies. Following goods are to be priced: A Radboud Mug, a ticket to a movie of their choice, a lottery ticket with 50-50 chances to win either 100$ or nothing, a 5-days Caribbean boat cruise holiday and a 1-liter Cola bottle. By choosing the specific goods it is ensured that some are more easy to evaluate than others. The prices chosen by our participants have no effect on their compensation. Prices are elicited using a slider with a fixed range of US Dollar amounts structured around the real value of the good, without revealing the former. Lowest possible prices are $0 and the maximum price adjusts according the specific good. We acknowledge that a slider with a fixed response range might induce people to pick a focal point, for example choosing the middle of the range or extremes. Avoiding such an effect is difficult regardless of the instrument. There is always a response range, whether it is a slider or a number in a range. We tested our responses for this effect and found no evidence, as our responses do not exhibit a focal point pattern. In Appendix C an example of the participant's survey view can be found. After completing the WTA-WTP part of the experiment the so-called PANAS check is performed by the individuals. The PANAS scale, derived from the PANAS check, by Watson et al. (1988) lets individuals assess their current affection towards a variety of words

describing feelings and emotions. Ideally the PANAS results will show that even after the content and WTA-WTP questions the participants are still affected by our prior mood induction. In designing the survey structure, we specifically took into account the mood induction valence, which is generally found to decline over time and can be expected to be no longer significant after 20 minutes as Isen et al. (1976) observe. The last section of the survey asks some general questions to provide more information on the study participants such as age, mother tongue, gender, level of education, employment and two questions on their prior knowledge of the mood videos or whether they had experience in evaluating the goods. This background information is included in the empirical model to identify certain characteristics. The last question asks participants to state their thoughts on the purpose of the survey. This information is of interest, because it shows once how involved the participants are in the study and acts as a control variable in the data section. In total the study shouldn't take longer then 30 minutes. The final amount of compensation of each participant consist of a fixed $0,35 for completing the assignment and an additional $0,15 for the correct answering of the content check. This reward is in line with the average payments for tasks on MT. The total number of participants was limited to 150 individuals.

# 4. Description of data

After gathering the data through the steps explained in the previous section, the individual responses are merged into one single dataset including all mood, WTA and WTP treatments. Following this step, it is necessary to cross validate the survey participants with their Crowdflower IDs. It appears that our approach was correct and no responses outside the Crowdflower recruitment pool were recorded. In total we have 154 responses, which resulted in 134 complete observations and 20 observations with missing values. Reasons for these missing values are either that the participant started the survey but didn't fully complete it or only completed it in part. Therefore, we will dismiss these 20 observations which gives us a 134 valid participants. Preliminary analysis showed that we had several cases in which participants were not able to answer a sufficient number of video context questions. As we specifically included these questions to assess the quality of our data, we define that the minimum threshold in these question must be at least 50% of correct answers. As we ask 5 questions on each video, we set the minimum number of correct context questions to 3 out of 5. This procedure further decreases the number of observations for our study to 118. However, we see this step as necessary in order to guarantee high quality data. Table 9 gives

the overview statistics for our dataset. We can see that the randomization has worked well, resulting in 60 WTA responses per good and a slightly less 58 responses for the WTP treatment. As for the measure of attention during the videos we create a so-called qscore or question-score which sums up the number of correct context questions for each individual. As we removed observations below our threshold we observe very high scores for all 3 treatments with averages in the 4,5 region. In other words, the observations considered further in the empirical part have on average answered 4,5 out of 5 questions correctly. While the number qscore observations for the sad (41 responses) and neutral (42 responses) treatment are even, we unfortunately only have 35 responses for the happy treatment group. Regarding the self-recorded mood state, we calculate a positive and a negative PANAS score for each participant individually, applying the same method as Watson et al. (1988). We find that the overall results combining all 118 responses are 31.52 for the positive affect and 14.95 for the negative affect. These numbers are comparable to the reference findings of the initial authors from the year 1988. A more detailed interpretation of both the WTA-WTP prices as well as the mood scores follows in Section 5 of this thesis.

Responses indicate that we have a balanced gender distribution of responses, with marginally more women taking the survey. Unsurprisingly our variable ntongue, which captures whether or not English is the respondents first language is almost 1. This confirms that only a handful of the participants did not grow up speaking English as their mother tongue. As mentioned earlier this is important to know because participants need to fully understand the directions given. The age variable is separated in six age categories including: under the age of 20 years old, between 20 -30 years, between 30 – 40 years, between 40 – 50 years, between 50 – 60 years and over the age of 60 years of age. An average of 3.13 puts the average participant in the age category of between 30 and 40 years old. Our youngest respondents are in under the age of 20 years old. On the other end of the scale we have participants in group 6, which indicates an age older than 60 years. Similarly, to the age variable, the educ variable is also constructed on a scale base. With the help of this variable we aim to identify the educational backgrounds of our respondents. We find that our participants come from a diverse educational background, spanning all categories from secondary school up to PhD level. The last background information that we collected from the participants concerns their employment status. Again we find respondents from all kinds of background. The following employment levels are included in the following order: student, employed, self-employed, job seeking, retired and other. Having collected background information on each individual we

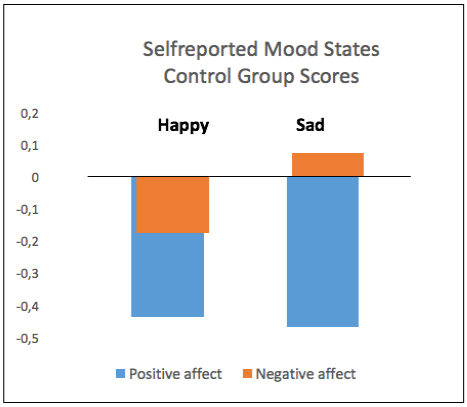
take previous findings on the role of familiarity into account, see for example List (2004), and ask our respondents to state on a 1 to 5 scale how familiar they are with the video they were shown and their experience in pricing the goods. The lower the score the more familiar the subjects are with both tasks. Interestingly we find a very high mean for familiarity (4.22) with the videos. We find that our participants have very low familiarity with the videos, which can be considered an asset because the mood impact should be most significant when watching the videos for the first time. A possible explanation for this could be that the videos are neither viral videos nor have yet received a high number of views. Familiarity with the pricing task appears to be a more common compared to the videos. At 3.88 it is still a high value and it can be hypothesized that while finding prices for common goods like a bottle of Cola should be high, we also asked for prices of less common goods such as the cruise and lottery. For both familiarity questions we find that participants have utilized the full scale of choices, from not at all familiar to very familiar.

# 5. Empirical results

In this section several statistical models will be applied to our dataset. First, we test the significance of our mood induction results for the different mood treatment groups. Secondly, we analyze the determinants of WTA and WTP prices in detail focusing on a set of mood variables. Several explanatory variables such as age, education, gender etc. are included. Lastly we calculate the WTA to WTP disparity as a ratio and compare our observations to a large number of previous studies by utilizing two meta-analyses by Horowitz and McConnell (2002) and Tuncel and Hammitt (2013).

## 5.1. Mood induction results

From the preceding sections we know that in our sample there are 41 participants in the sad mood treatment, 35 in the happy mood and 42 in the neutral mood group. As a first step in the analysis of WTA-WTP determinants we calculate the PANAS positive and negative affect scores for all goods and treatment groups. To allow for better comparison we present the individual groups scores as over- and underperformance relative to two control groups. Acting as our first control group we take the scores of the participants under the neutral treatment as displayed in figure 3. Figure 4 shows our results in comparison to Watson et al. (1988) original PANAS scores.



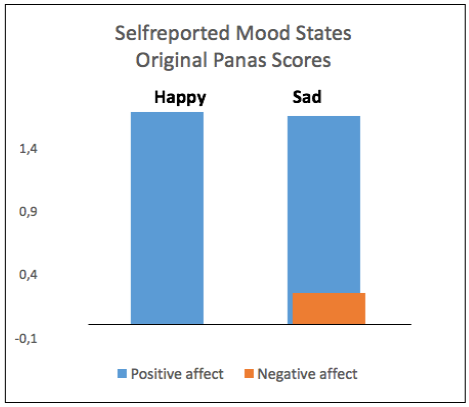




**Figure 3, PANAS mood score A** **Figure 4, PANAS mood score B**

**Blue bars represent the mean self-reported positive affect score and orange bars the mean negative affect score compared to the neutral (non-mood) treatment scores. E.g. the zero line represents the mean neutral treatment group affect scores. A positive or negative mean score larger than zero indicates higher self-reported positivity or negativity in either the happy or sad treatment group as compared to the neutral treatment group. The "happy" bar displays the mean affect scores for participants under the happy treatment, the bar on the right "sad" the scores for the sad treatment participants.**

We find that compared to the original PANAS results, see Figure 4, our positive affect scores both in the happy and sad treatment are significantly higher as evident from the blue bars. Our participants are generally happier than the participants in the original subject pool in the late 1980s. Regarding the negative affect score we find that our mood induction was successful, in the sad treatment group the negative score is higher than the sad score reported in the original paper. In the happy treatment group, we find the same level of negative affect as in the original paper, which confirms that our participants reported to be neither more nor less in a negative affect than the original findings.

Focusing on the neutral mood treatment scores from our data in Figure 3, we construct an identical chart as for the original paper scores. Results are more indicative as participants are recruited from the same pool and are shown the same survey including the survey setup. The bar on the left shows the self-reported affect scores of participants in the happy treatment relative to the control group scores. While we find our positive affect scores to appear lower compared to the control groups scores, the negative affect scores are lower than both the control group and sad treatment group. We conclude that while we were not able to increase the happiness of our participants, we were able to successfully reduce their negative affect scores. In sum, participants in the happy group are not happier, but significantly less sad compared to the control group. An even more obvious result is found for the sad treatment scores. We find that they report their positive affect as the lowest among all groups and on the other hand exhibit the highest negative affect score. In summary, our participants in the sad

group are least happy and most sad across all groups. We consider the mood induction process to be successful, however when trying to test for statistical significance using a classic t-test, our findings are insignificant. We test both affect scores, positive and negative, for both treatment groups in comparison to the mean positive and negative scores of the control group. Table 12 to Table 15 in Appendix A show the empirical results. Further we conduct the Kruskal–Wallis test, which constitutes a multiple-sample generalization of the two-sample Wilcoxon rank sum test on the observed affect scores. The results in Table 16 and 17 confirm the t-test estimations.

As mentioned before, the mean mood treatments don't appear to be significantly deviating from the control group mean to the 10% significance level. However, we should not only focus on the t-test mean results but take the above relative differences between groups into account. Our observed mood differences are only small deviations from the control group mean, therefore the t-test does not capture the differences. For our analysis we can still identify the mood induction as a success because the deviations are in line with what we expected. Further to our defense we identify that in previous mood studies comparably small deviations were observed. In conclusion we observe the strongest mood induction results for the sad treatment group, followed directly by the happy mood group.

## 5.2. Determinants of WTP and WTA

One of the main questions of this thesis is to analyze whether an individual's mood has an influence on its minimum WTA and maximum WTP. We develop two hypotheses based on a conjunction of the Mood Maintenance Hypothesis by Isen and Patrick (1983) and Affect Infusion Model (AIM) by Forgas (1995). We translate these two models as the following two hypotheses:

Hypothesis 1) *People behave according to AIM:*

> *Participants in the happy treatment exhibit lower WTA but higher WTP prices, whereas under a sad treatment we would see higher WTA and lower WTP prices.*

Hypothesis 2) *People behave according to MMH:*

> *Participants in the happy treatment exhibit higher WTA but lower WTP prices, whereas under a sad treatment we would see lower WTA and higher WTP prices.*

Table 2 shows a visual interpretation of our two hypotheses. The arrows represent whether WTA or WTP prices are either going up or down under a specific mood.

| | HAPPY | SAD |
|---|---|---|
| Mood Maintenance Hypothesis | WTA ↑ WTP ↓ | WTA ↓ WTP ↑ |
| Affect Infusion Model | WTA ↓ WTP ↑ | WTA ↑ WTP ↓ |

**Table 2, Hypotheses: Mood and WTA-WTP prices**

### 5.2.1. Descriptive analysis of WTA and WTP data

As a starting point for our analysis of WTA WTP determinants we consult Table 3. It displays the respective mean WTA or WTP prices for each good as well as the resulting disparity, separated by the participants' mood treatment. In addition, we present t-test statistics on the disparity as indicated by the asterisks. Significance indicates that the null hypothesis of mean WTA equaling mean WTP responses has to be rejected at the respective levels.

| Treatment | | Good | | | | |
|---|---|---|---|---|---|---|
| | | University mug | Movie ticket | Lottery ticket | Boat cruise | Cola bottle |
| Neutral | WTA | $ 4,02 | $ 8,21 | $ 23,83 | $ 905,67 | $ 1,95 |
| | WTP | $ 3,92 | $ 8,67 | $ 12,11 | $ 994,28 | $ 1,47 |
| | *difference* | *$ 0,10* | *$ -0,46* | *$ 11,72 *** | *$ -88,61* | *$ 0,49* |
| Happy | WTA | $ 3,32 | $ 6,23 | $ 27,00 | $ 1.010,08 | $ 1,68 |
| | WTP | $ 3,16 | $ 7,86 | $ 17,41 | $ 841,59 | $ 1,35 |
| | *difference* | *$ 0,16* | *$ -1,63 ** | *$ 9,59* | *$ 168,49* | *$ 0,33* |
| Sad | WTA | $ 4,12 | $ 8,22 | $ 21,39 | $ 1.117,57 | $ 1,34 |
| | WTP | $ 3,85 | $ 8,33 | $ 9,83 | $ 990,28 | $ 1,21 |
| | *difference* | *$ 0,27* | *$ -0,12* | *$ 11,56 *** | *$ 127,29* | *$ 0,13* |
| Overall | WTA | $ 3,91 | $ 7,78 | $ 23,58 | $ 1.009,52 | $ 1,66 |
| | WTP | $ 3,61 | $ 8,26 | $ 13,41 | $ 935,12 | $ 1,34 |
| | *difference* | *$ 0,30* | *$ -0,48* | *$ 10,17 **** | *$ 74,40* | *$ 0,32 ** |

**Table 3, Mean WTA or WTP prices by treatment group and the resulting gaps**
**Asterisks indicate the statistical significance level: * at 10%, ** at 5% and *** at 1%**

Overall mean prices, covering the whole available data from the survey, are analyzed first. The WTA-WTP disparity is visible for 4 out of our 5 goods for which we let the participants elicit prices. The only good which doesn't display the disparity is the movie ticket, as our participants were, on average, willing to spend more money on acquiring tickets then on selling them. Statistical significant gaps are observed for the lottery ticket at the very high 1% level and the cola bottle at the 10% level.

As the lottery ticket exhibits the highest significance we start our analysis of individual mood on gap characteristics with this good. Survey results for the lottery prices exhibit a clear WTA-WTP disparity over all treatments. In fact, WTA ($23.58) prices exceed the WTP ($13.41) results on average by more than 75%. Sad and neutral mood treatment gaps are significant at the 5% level at similar values around $11,6. While the value of the gap appears similar, we find that the sad WTA and WTP are the lowest mean prices across all treatments with a WTA of $21.39 and a WTP of $9.83. The highest WTA ($27) and WTP ($17.41) mean prices are found for the happy treatment group. Participants from the neutral treatment group stated prices in between the happy and sad treatment group results with a WTA of $23.83 and a WTP of $12.11. While we don't find significance for the happy treatment gap, we observe that it takes the smallest gap in the lottery results with a value of $9.59. It appears that for the lottery ticket, the participants' mood does affect the level of response WTA and WTP, but without significantly influencing the gap.

We hypothesize that stating prices for the Cola bottle is the easiest for our study participants. We find the WTA-WTP gap in all treatments, however the only significant gap is displayed when accounting for all responses. At the 10% level, we observe the gap with a value of $0.32. Overall mean WTA is $1.66 and WTP is $1.34. Participants in the neutral mood group are setting both WTA ($1.95) and WTP ($1.47) prices higher than sad or happy treatment participants. Lowest prices are stated by the sad treatment participants with WTA ($1.34) and WTP ($1.21). Focusing on the calculated gaps, we find the largest disparity in the neutral group ($0.49), followed by happy ($0.33) and eventually sad ($0.13) participants.

The Radboud university mug received an overall mean WTA of $3.91 and WTP price of $3.61 and a resulting gap of $0.3. When separating these prices according to the 3 mood treatment groups we find that people in the happy mood stated the lowest mean prices for both WTA ($3.32) and WTP ($3.16). Highest mean WTA prices are observed for individuals under the sad treatment with a mean WTA of $4.12 and WTP of $3.85. Our control group mean prices are in between the happy and sad treatment prices and generally closer to the overall mean. For the all mood treatments we observe the WTA-WTP gap. The largest observed gap is found for the sad treatment ($0.27), followed by the happy ($0.16) and neutral mood group ($0.1).

Concerning responses for movie tickets we observe no gap regardless of the treatment, as evident from overall mean WTP ($8.26) exceeding the WTA ($7.78) price. Similar to the observations for the university mug the lowest mean WTA ($6.23) and WTP ($7.86) prices are stated by participants under the happy treatment. Interestingly this result is significant at the 10% level with the gap taking the value -$1.63. It is not possible to identify a group with highest mean prices as the highest WTP ($8.67) price is observed by the neutral but the highest WTA ($8.22) price by the sad treatment. Both WTA and WTP of the sad treatment group clearly exceed the happy treatment values. Further should be mentioned that the gap is barley observed for the sad treatment group with a value of -$0.12 compared to the large gap in the happy treatment group.

The last good for which we elicited prices is the 5 day Caribbean boat cruise, which should be the most challenging pricing task for our survey participants. Overall we find the disparity with mean WTA at $1009.52 exceeding WTP prices at $935.12 which results in a gap of $74.4. Mean WTA ($1117.57) and WTP ($990.28) prices of sad participants are higher than prices set by the happy treatment group. Results for the happy treatment participants are WTA ($1010.08) and WTP ($841.59). Both happy and sad observations display the WTA-WTP gap with the happy one ($168.49) exceeding the sad treatment gap ($127.29). Participants in the neutral treatment did not exhibit the disparity, but actually a reversed one with a negative value of -$88.61.

It appears that mood does have an effect on both peoples' WTP or WTA prices and the resulting gap. Further there appears to be some variety based on the type of good studied. For the three products: university mug, movie ticket and boat cruise the mean WTP-WTA prices of the sad treatment group exceed those of the happy group. We also observe that regardless of the type of product whether people are happy or sad, the relation between WTA exceeding WTP (gap) or the other way WTP exceeding WTA stays equal among the two mood treatments for all goods. Both in the case of the lottery and the cola bottle participants mean WTP and WTA prices are higher in the happy group than in the sad group. We acknowledge that significance is only found in a few cases, which we attribute mainly to the experimental limitations. It has to be considered that due to this being a master's thesis we are restricted in the scope of study participants. A larger number of observations should create higher significance in an identical study. Further it becomes evident that models such as AIM and MMH can only be used for generalizations as we find clear good specific variation in

responses. For example, we find that sadness significantly decreases both WTA and WTP for the lottery ticket, whereas for the movie ticket we find that happiness significantly decreases WTA and WTP. In order to identify underlying changes in WTA and WTP pricing by individuals under certain mood treatments we need to study the respective price determinants.

### 5.2.2. Regression models on WTA and WTP data

To test the previously found correlation between mood and WTA or WTP prices, a statistical model is constructed and run. We conduct multivariate analyses on the WTA and WTP prices of each good to determine influential factors. Literature emphasizes that both WTA and WTP prices need to be tested for zero responses, which would censor the data and result in a non-normal distribution. From our data we know that we have zero responses for both WTA and WTP prices of certain goods. In our WTA responses we find 5 zero-value responses distributed over the movie ticket, lottery and cola bottle goods. For WTP prices we observe two zero-responses, one for the university mug and one for the lottery. Considering other studies observe up to 50% of zero-value WTP responses, see in Havet (2012), our participants exhibit higher willingness to spend money on survey goods. Our data also indicates maximum values at the other end of the scale, which would constitute right censoring. We have 3 maximum WTP prices, as well as 3 maximum WTA prices for the boat cruise ($2000). Further we have one maximum WTA response on the university mug ($10). In our analysis we have to consider both data censorings in choosing a fitting model. There are two methods described in literature to account for these extreme value responses, one is to use a truncated regression model or alternatively a Tobit model. Considering that all responses have to be strictly positive we truncated the data at zero for both WTP and WTA prices. Further we truncated WTP values at the respective good's maximum value. This eliminates any possible estimations past the given maximum for willingness-to-purchase values. Afterwards a truncated regression model is chosen for WTP values as it takes into account the eliminated responses in the estimation. However, for the WTA responses we consider the possibility of responses exceeding the maximum threshold. The reason for doing so, lies in the possibility of a respondent's actual minimum WTA a sale of the specific good to exceed the maximum choice range of the survey. To incorporate this assumption in our model, we apply a Tobit model on WTA prices. Histograms of our dependent variables, WTA and WTP prices for each good, are included in the Appendix A and clearly evidence the significance of zero-responses. To test for multicollinearity we tested our regression models by estimating tolerance (TOL) and the Variance inflation factor (VIF). We don't find multicollinearity in

our model, as the observed VIF ranges from 1-1.6. and tolerance around the 0.8 mark. According to Hill et al. (2008) multicollinearity is indicated by VIF exceeding 5-10 threshold or TOL below a value of 0,2. Other than the differentiation between Tobit model for WTA and truncated regression for WTP, the models are essentially the same. Equation 1 describes the Tobit and truncated regression model:

$$WTP_{i,j}\ or\ WTA_{i,j} = \beta_0 + \beta_1 mood_{i,j} + \beta_2 gender_{i,j} + \beta_3 age_{i,j} + \beta_4 educ_{i,j} + \beta_5 jobvar_{i,j} + \beta_6 familiar_video_{i,j} + \beta_7 familiar_pricing_{i,j} + \varepsilon_{i,j}, \quad (1)$$

where $WTP_{i,j}$ or $WTA_{i,j}$ is the respective WTP or WTA price stated for good $j$, by the survey respondent $i$. For the first regression model we include 7 independent variables based on data collected through survey responses. The independent variable $mood_{i,j}$ is a score constructed by subtracting the individuals negative affect score form the positive one. The variable measures a person's mood, with a high positive score identifying the person as happy and a low score as sad. The second variable $gender_{i,j}$ represents the participants gender, where 1 is male and 0 female. The $age_{i,j}$ variable uses the age categories described in section 4. It ranges from below 18 years to over 60 years of age and increases with age. To measure effects of education on the observed prices we include the $educ_{i,j}$ variable. Similar to the $age_{i,j}$ variable it increases with the level of education achieved by the survey participants. Because the current employment situation of the individual could impact his or her prices we include $jobvar_{i,j}$ in the model. Due to the categorical nature of the survey collection we need to create a new variable based on our employment data. The variable can take the value zero if the participants didn't want to disclose his current employment situation, for students and job-seeking individuals we assign value 1, currently employed or self-employed individuals are placed in group 2 and already retired people in group 3. This method is chosen because we assume individuals' available wealth to increase with the group they are assigned in, for example individuals currently in group 3 are supposed to have more money available then group 2 individuals. The last two independent variables $familiar_video_{i,j}$ and $familiar_pricing_{i,j}$ are measuring the individuals familiarity with whether the video shown or their experience in pricing the shown products. Survey participants highly familiar with a task have the lowest score, the less familiar they are the higher the variable.

Results for the two regression models are displayed below in Table 4 for WTP as the dependent variable and Table 5 with WTA as dependent variable.

WTP Mood

| | (1) wtp1 b/se | (2) wtp2 b/se | (3) wtp3 b/se | (4) wtp4 b/se | (5) wtp5 b/se |
|---|---|---|---|---|---|
| **eq1** | | | | | |
| Mood | 0.0229 | 0.0958* | −0.263 | 2.878 | 0.0278 |
| | (0.035) | (0.054) | (0.573) | (6.482) | (0.019) |
| Gender | −0.167 | −1.965 | 34.53* | −25.58 | −0.367 |
| | (0.820) | (1.298) | (18.703) | (156.002) | (0.454) |
| Age | 0.213 | 0.315 | −2.729 | −37.10 | −0.0993 |
| | (0.305) | (0.476) | (5.483) | (59.313) | (0.178) |
| Education | 0.529 | −1.530** | 17.79* | −28.48 | −0.225 |
| | (0.437) | (0.680) | (9.407) | (80.348) | (0.229) |
| Job | −0.111 | 0.189 | 10.07 | 251.0** | 0.169 |
| | (0.582) | (0.890) | (13.516) | (124.782) | (0.325) |
| Familiarity w/ Video | 0.474 | 1.392 | −8.725 | 69.23 | 0.0420 |
| | (0.575) | (0.875) | (8.625) | (101.990) | (0.283) |
| Familiarity w/ Pricing | −0.283 | −1.153 | 7.123 | −17.07 | −0.358 |
| | (0.572) | (0.885) | (9.213) | (104.536) | (0.299) |
| Constant | 0.0191 | 8.880** | −74.23 | 364.7 | 2.659** |
| | (2.446) | (3.655) | (55.685) | (442.924) | (1.214) |
| **sigma** | | | | | |
| Constant | 2.047*** | 3.406*** | 19.43*** | 394.7*** | 0.982*** |
| | (0.319) | (0.439) | (5.791) | (57.703) | (0.188) |
| Observations | 40 | 40 | 40 | 38 | 40 |

dependent variable: WTP, dropped variable ntongue; only happy and sad treatment groups

**Table 4, Influence of mood on WTP prices for participants in the mood treatment**
**Dependent variables are: wtp1 – university mug, wtp2 – movie ticket, wtp3 – lottery, wtp4 – boat cruise and wtp5 – cola bottle**

We find that our observations vary from 38 to 40, depending on the good observed. This can be explained by the truncation of the data, as mentioned above some responses are either at the minimum (zero) or maximum of the choice range and therefore have to be excluded. It has to be considered that we only regress these models on individuals in either the happy or sad treatment. This results in roughly 20 prices from neutral respondents to be excluded. It is necessary to remove them because we use their responses as a reference point in order to judge whether an individual is happy or not as mentioned in section 5.1 of this thesis. Concerning the statistically significant results in Table 4, we find that mood is significant only for the second good, which is the movie ticket. At the 10% significance level with a coefficient of 0.0958, mood determines the willingness-to-purchase price of movie tickets. A positive coefficient in this model can be interpreted in the way that for each increase in the mood variable their willingness-to-purchase increases by roughly $0.10. The next significant estimation is the influence of gender on lottery participation. We find a coefficient of 34.53 at the 10% significance level in the gender variable. This finding corresponds to previous studies on gender and risk-taking see Powell and Ansic (1997), who find that men are more likely to

take risks than women. The same holds in our model, men are willing to spend significantly more on the risky lottery ticket than women. For the role of education on the stated WTP prices we find statistical significance in two goods. At the 5% significance level we find a negative coefficient of -1.53 with the movie ticket being the dependent variable. With each step increase in the individuals achieved education their maximum willingness-to-purchase a movie ticket reduces by $1.53. The opposite is found when the good is a lottery ticket. People increase their maximum willingness-to-purchase with a higher level of education by $17.79. One potential explanation might be that more educated survey participants have a better understanding of the lottery probabilities and therefore bet more for the ticket. Especially considering that the mean WTP price for the ticket was quite low with $13.41, see descriptive statistics in Appendix A. With more maturity in their job career individuals WTP price for a boat cruise increases by $251. The finding is significant at the 5% statistical significance level. This is in line with our hypothesis that employed or even retired survey participants have more financial means to spend on holidays. Considering the significance of each models constant we can observe two results at the 5% significance level, one with a value of $8.88 for the movie ticket regression and one for the cola bottle at $2.659. In summary we find mood to be taking a significant impact on the WTP prices only for the movie ticket. Other statistically significant variables are gender of participant, education and the employment status.

WTA Mood

| | (1) wta1 b/se | (2) wta2 b/se | (3) wta3 b/se | (4) wta4 b/se | (5) wta5 b/se |
|---|---|---|---|---|---|
| **model** | | | | | |
| Mood | −0.0723 | −0.0113 | −0.660* | −2.955 | −0.0167 |
| | (0.043) | (0.058) | (0.372) | (8.893) | (0.019) |
| Gender | 0.462 | −1.040 | 6.559 | −22.50 | 0.434 |
| | (0.826) | (1.119) | (7.121) | (170.561) | (0.367) |
| Age | −0.570 | −0.579 | −1.115 | −56.83 | −0.100 |
| | (0.414) | (0.559) | (3.587) | (85.935) | (0.184) |
| Education | −0.655 | 0.402 | 7.088 | 178.2 | 0.00904 |
| | (0.530) | (0.716) | (4.596) | (111.588) | (0.235) |
| Job | 0.787 | −0.525 | 2.362 | −164.5 | 0.181 |
| | (0.547) | (0.739) | (4.730) | (117.192) | (0.243) |
| Familiarity w/ Video | 0.261 | 0.947* | −8.033** | 91.37 | −0.317* |
| | (0.371) | (0.501) | (3.200) | (76.654) | (0.165) |
| Familiarity w/ Pricing | −0.698* | −1.002* | −1.265 | −65.61 | −0.114 |
| | (0.394) | (0.532) | (3.390) | (81.735) | (0.175) |
| Constant | 8.836*** | 9.609** | 50.64** | 989.2* | 3.309*** |
| | (2.624) | (3.535) | (22.574) | (543.820) | (1.158) |
| **sigma** | | | | | |
| Constant | 2.129*** | 2.879*** | 18.34*** | 439.8*** | 0.946*** |
| | (0.257) | (0.347) | (2.245) | (54.199) | (0.111) |
| Observations | 36 | 36 | 36 | 36 | 36 |

dependent variable: WTA, dropped variable ntongue; only happy and sad treatment groups

**Table 5, Influence of mood on WTA prices for participants in the mood treatment**
**Dependent variables are: wta1 – university mug, wta2 – movie ticket, wta3 – lottery, wta4 – boat cruise and wta5 – cola bottle**

In the next step, we analyze the results of the Tobit model on the participants WTA responses, see Table 5. As expected some results are removed from the Tobit model due to censoring. In total we have 36 observations per good. Taking the same approach as in the WTP model, we start by identifying the statistical significance of the mood variable in the models. In the WTA responses we find mood to be significant at the 10% level for the lottery ticket. In contrast to the positive coefficient in the WTP model, all mood estimates in the WTA model are negative. However, we have to be cautious with interpreting the coefficients signs as they are not significant. The value of the only significant one is $-0.66. This can be interpreted as the happier a person is the lower is their minimum willingness-to-accept to let go of a good. Or put in other words, the sadder an individual the higher their WTA prices for the lottery ticket. Interestingly, previously found factors influencing prices such as education and gender are not significant in the WTA domain. In fact, what's more significant are the two familiarity variables. Familiarity with the videos shown significance for the movie ticket, the lottery and the cola bottle. For the movie ticket and cola bottle significance is at the 10% level, for the lottery ticket at the 5% significance level. We find negative coefficients for the lottery and cola bottle, taking values of $-8.033 and $-0.317 respectively. The interpretation of this is that the higher the unfamiliarity of the individual with the video the lower their willingness-to-accept a sale price for the product. Or simply put, the more familiar with the video the higher the minimum amount required in order to let go of it. As we hypothesized earlier, higher familiarity with the videos should result in a lower emotional impact of the video on the person. In case of the movie ticket we find a positive coefficient of $0.947, which means that in this case being less familiar with the video increases the minimum WTA. As mentioned above, we additionally find significant results for the familiarity with the pricing of the products. We observe significance at the 10% level for both the university mug and the movie ticket. Both coefficients have a negative sign with the mug one taking the value of $-0.698 and the movie one $-1.002. The results can be interpreted in the way that the less familiar the survey participants are with the actual prices of said goods, the lower their minimum WTA prices are. This seems logical as participants might underestimate the price of a good with an unknown price simply because of lack of knowledge. As for the constant of the 5 WTA models we find them all to be significant. The mug and the cola bottle constant is highly significant at the 1% level, the movie ticket and lottery at the 5% level and lastly the boat cruise at the 10% level. In general, we find more statistical significance in the WTA models then in the WTP ones.

Whereas before we only considered mood to be a scale along which happiness increases, it follows that in the next step we investigate the role of both happiness and sadness individually. We apply the same model as above, however we exclude the independent $mood_{i,j}$ variable and replace it by two dummy variables They indicate whether the survey participant's positive or negative affect score exceeds the neutral treatment average. The control groups average positive affect score is calculated to be 31.8, with the negative affect score averaging 14.97. Therefore the positive affect score dummy $happydum_{i,j}$ takes value of 1 if the individuals score is higher than 31.8 or 0 otherwise. In the same fashion the $saddum_{i,j}$ takes value 1 if the individuals negative affect score is larger than 14.97 or 0 otherwise. For simplicity we will describe individuals exceeding the control group score as happier or sadder relative to the control group. The model is described as:

$$WTP_{i,j}\ or\ WTA_{i,j} = \beta_0 + \beta_1 saddum_{i,j} + \beta_1 happydum_{i,j} + \beta_2 gender_{i,j} + \beta_3 age_{i,j} + \beta_4 educ_{i,j} + \beta_5 jobvar_{i,j} + \beta_6 familiar_video_{i,j} + \beta_7 familiar_pricing_{i,j} + \varepsilon_{i,j} \quad (2)$$

WTP – Control Group PANAS score

| | (1) wtp1 b/se | (2) wtp2 b/se | (3) wtp3 b/se | (4) wtp4 b/se | (5) wtp5 b/se |
|---|---|---|---|---|---|
| **eq1** | | | | | |
| saddum | 0.255 | −2.141* | 20.11** | −87.66 | −0.296 |
| | (0.818) | (1.245) | (9.779) | (153.591) | (0.438) |
| happydum | 0.824 | 2.021 | 21.92** | 2.101 | 0.798* |
| | (0.857) | (1.309) | (10.317) | (158.987) | (0.465) |
| Gender | −0.311 | −1.854 | 21.72** | −6.539 | −0.416 |
| | (0.843) | (1.289) | (10.221) | (157.525) | (0.460) |
| Age | 0.252 | 0.496 | −3.211 | −32.01 | −0.0323 |
| | (0.300) | (0.454) | (3.706) | (58.496) | (0.167) |
| Education | 0.398 | −1.563** | 10.31** | −19.56 | −0.286 |
| | (0.457) | (0.697) | (5.034) | (83.441) | (0.239) |
| Job | −0.143 | 0.452 | −0.0288 | 266.9** | 0.176 |
| | (0.582) | (0.851) | (8.663) | (122.724) | (0.307) |
| Familiarity w/ Video | 0.467 | 1.216 | −2.499 | 53.16 | −0.00160 |
| | (0.551) | (0.809) | (5.249) | (97.255) | (0.257) |
| Familiarity w/ Pricing | −0.229 | −1.104 | 6.437 | −11.47 | −0.307 |
| | (0.554) | (0.831) | (5.818) | (100.320) | (0.275) |
| Constant | 0.0620 | 9.882*** | −64.89* | 414.1 | 2.810** |
| | (2.406) | (3.472) | (34.562) | (443.106) | (1.135) |
| **sigma** | | | | | |
| Constant | 2.029*** | 3.284*** | 14.85*** | 393.5*** | 0.947*** |
| | (0.315) | (0.418) | (3.382) | (57.492) | (0.176) |
| Observations | 40 | 40 | 40 | 38 | 40 |

dependent variable: WTP, dropped variable ntongue; only happy and sad treatment groups

**Table 6, Influence of mood on WTP prices for participants in either sad or happy treatment**
**Dependent variables are: wtp1 – university mug, wtp2 – movie ticket, wtp3 – lottery, wtp4 – boat cruise and wtp5 – cola bottle**

Results for the truncated regression model on the WTP prices are displayed in Table 6. In total we have 40 observations for each good and significant estimations for all but the

university mug. It appears that the WTP price which survey participants assign for the mug cannot be explained by our model. First statistically significant results are found for the $saddum_{i,j}$ in both the movie and lottery ticket. Participants reporting a higher negative affect score than the average negative affect score of the control group, exhibit a lower maximum willingness to purchase by $-2.141. This observation is significant at the 10% level. For the lottery ticket we find that individuals sadder than the control group to increase their willingness to purchase prices by $20.11 at the 5% significance level. It appears, that sadness increases the preference for risk taking, but reduces the desire for common leisure goods such as movie tickets. In addition to finding statistical significance in our sad participants, measured by the dummy variable $saddum_{i,j}$, we also find it for happy participants in the $happydum_{i,j}$ dummy. A surprising find is that both sad and happy participants exhibit significantly higher maximum WTP prices for the lottery ticket. For the lottery's WTP we find $happydum_{i,j}$ to increase the price by $21.92 at the 5% significance level. This observation explains why we didn't see significance in the general mood scale variable, because the effect being significant in both mood states would cancel out on a scale. We can argue that both happiness and sadness increase a person's willingness to purchase a lottery ticket, as per our survey observations. A second significant impact of happiness is found for the cola bottle. At the 10% significance level we see an increase of the participants WTP by $0.798. Other significant variable include gender at the 5% level in case of the lottery ticket ($21.72). This matches our observation for the mood variable model above. Men are more willing to purchase risky goods than women. Education as well seems to play an important role in determining a person's WTP price for goods such as movie tickets and lottery tickets. For the movie ticket we find a decrease in the individual's maximum willingness-to-purchase with increasing level of education. Per step increase in education the WTP decreases by $-1.563 at the 5% statistical significance level. For the lottery however the opposite effect is found. Per step increase in the highest achieved educational degree the maximum WTP increases by $10.31. Lastly we find that the current employment to have a significant effect on the WTP price of the boat cruise. The further a person has progress in his professional career the more their maximum WTP increases for this product. Our model quantifies this increase to be $266.9 observed at the 5% significance level. As the results for $gender_{i,j}$, $education_{i,j}$ and $job_{i,j}$ are significant and have roughly the same value as in the $mood_{i,j}$ model we accept the identical explanation for these observations. Further these results act as a robustness check for our initial model. Lastly we note the constant of this truncated regression model. Significance is found for the movie ticket, lottery and cola bottle model. In

comparison to the $mood_{i,j}$ model we have one more significant constant, the lottery. Because we are interested in the differences between WTP and WTA prices we use the same empirical approach on the WTA responses from our survey data, see Table 7 for results.

WTA – Control Group PANAS score

| | (1) wta1 b/se | (2) wta2 b/se | (3) wta3 b/se | (4) wta4 b/se | (5) wta5 b/se |
|---|---|---|---|---|---|
| **model** | | | | | |
| saddum | 1.198 | 0.621 | 9.561 | 147.2 | −0.277 |
| | (0.941) | (1.243) | (8.164) | (189.412) | (0.409) |
| happydum | −0.401 | 0.0834 | 4.096 | 7.477 | −0.222 |
| | (0.823) | (1.093) | (7.277) | (166.266) | (0.359) |
| Gender | 0.289 | −1.108 | 3.054 | −36.54 | 0.430 |
| | (0.850) | (1.128) | (7.425) | (171.136) | (0.371) |
| Age | −0.631 | −0.599 | −2.102 | −61.72 | −0.104 |
| | (0.421) | (0.558) | (3.691) | (85.356) | (0.183) |
| Education | −0.569 | 0.364 | 8.888* | 168.1 | 0.102 |
| | (0.532) | (0.704) | (4.665) | (108.795) | (0.231) |
| Job | 0.687 | −0.542 | 1.329 | −167.1 | 0.160 |
| | (0.552) | (0.732) | (4.843) | (114.966) | (0.241) |
| Familiarity w/ Video | 0.393 | 1.060* | −5.925 | 116.3 | −0.394** |
| | (0.421) | (0.558) | (3.669) | (84.982) | (0.184) |
| Familiarity w/ Pricing | −0.677 | −1.049* | −1.271 | −76.00 | −0.0464 |
| | (0.406) | (0.537) | (3.532) | (82.026) | (0.177) |
| Constant | 6.946*** | 9.116*** | 25.78 | 877.6* | 3.059*** |
| | (2.458) | (3.245) | (21.406) | (493.892) | (1.065) |
| **sigma** | | | | | |
| Constant | 2.165*** | 2.870*** | 18.86*** | 436.0*** | 0.944*** |
| | (0.261) | (0.346) | (2.300) | (53.771) | (0.111) |
| Observations | 36 | 36 | 36 | 36 | 36 |

dependent variable: WTA, dropped variable ntongue; only happy and sad treatment groups

**Table 7, Influence of mood on WTA prices for participants in either sad or happy treatment**
**Dependent variables are: wta1 – university mug, wta2 – movie ticket, wta3 – lottery, wta4 – boat cruise and wta5 – cola bottle**

Total observations are 36 WTA responses per good. Whereas we found significance for the lottery ticket in the $mood_{i,j}$ model, we don't find any significance in either mood dummy. Independent variables that appear to determine the survey participants' minimum willingness-to-accept at statistically significant levels are their education level and both familiarity variables. For each increase in the individuals' educational level their WTA price for the lottery ticket increases by 8.888 at the 10% significance level. A possible explanation of this observation could be that the higher the educational level the better the persons understanding of probabilities and gambling. The interaction of familiarity with the video shown and the product specific WTA prices we find increasing prices for the movie tickets and decreasing prices for the cola bottle. Considering that with each increase in the familiarity variable the actual familiarity with the video decreases, we observe that the less familiar the participants are with the video, the higher they state their minimum WTA for the movie ticket. For each decrease in familiarity the WTA increases by $1.06 at the 10% significance level. This appears to be a product specific observation, as for the cola bottle we observe decreasing

WTA prices with increasing unfamiliarity. At the 5% statistical significance level we observed a decrease of $-0.394. Familiarity with the pricing task is only significant for the movie ticket. Similar to our observation in the $mood_{i,j}$ we observed decreasing WTA prices ($-1.049) at the 10% level. This indicates that the less familiar our participants are with the price of the good, the lower they state their minimum willingness-to-accept. Compared to Table 6, the WTP model, we find 4 constants to be significant. At the 1% significance level we find the university mug, the movie ticket and the cola bottle. Slightly less significance is reported for the constant of the boat cruise at 10% level and no significance for the lottery ticket.

To conclude, we observe significant impact of individuals in either a positive, happy, or negative, sad, mood on their maximum willingness-to-purchase price for specific goods. In our case we observe this interplay for the movie ticket, the lottery and the cola bottle. Sadness appears to reduce WTP prices in the field of leisure products such as the movie ticket, whereas it increases risk-seeking in the lottery domain. Happiness increases WTP prices both for risky products and ordinary market goods such as the cola bottle. Other variables determining an individual's maximum willingness-to-purchase price are gender, in the case of risky products, the educational background for leisure and risky products and the employment status to determine the price for a vacation. According to our data, neither sadness nor happiness have a statistically significant impact on the survey participants' minimum willingness-to-accept. Important factors are the persons highest achieved educational degree and to which level he is familiar with both the video presented and the price of the good. The less familiar a person is with the video, the higher their willing-to-accept price on leisure products such as the movie. For common goods such as the cola bottle we observed the opposite effect, less familiarity results in lower WTA prices. Lastly we observe that the higher a person's familiarity with the price of leisure products, movie ticket, the more they will ask I order to let go of the product.

A robustness test is conducted on the previous findings, by using the same regression model but slightly adjusting the $saddum_{i,j}$ and $happydum_{i,j}$. To identify higher or lower happiness or sadness we take the original positive and negative affect scores of Watson et al. (1988). The average positive affect score determined in their paper was 29.7 and the average negative affect score 14.8. Equation 3 displays the robustness check regression model:

$$WTP_{i,j}\ or\ WTA_{i,j} = \beta_0 + \beta_1 saddum1_{i,j} + \beta_1 happydum1_{i,j} + \beta_2 gender_{i,j} + \beta_3 age_{i,j} + \beta_4 educ_{i,j} + \beta_5 jobvar_{i,j} + \beta_6 familiar_{video_{i,j}} + \beta_7 familiar_{pricing_{i,j}} + \varepsilon_{i,j} \quad (3)$$

Results can be found in Table 10 and Table 11 in the Appendix. We find similar results as in our previous model and therefore identify our model as robust.

## 5.3. Gap comparison to previous findings

In Section 5.4 the determinants of WTA and WTP responses in connection to mood induction were identified. In this section we construct the WTA-WTP disparity and compare our findings with previous research results. The most common approach for measuring the disparity is by dividing the mean WTA by the mean WTP. An extensive meta-analysis of early WTA-WTP research has been conduction by Horowitz and McConnell (2002) in which they aggregate 50 studies. Tuncel and Hammitt (2014) base their study on the previous meta-analysis and extend their scope including new studies published after Horowitz and McConnell (2002) paper. We base this section on both papers and compare our results to theirs. To do so we calculate the mean and geometric mean ratio, $\overline{WTA}/\overline{WTP}$, for our observations. The comparison is demonstrated below in Table 8:

| | | Our Results - Ratio | | | | | | | | Horowitz and McConnell (2002) | | Tuncel and Hammitt (2013) | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Mean | | | | Geometric mean | | | | Mean | Geometric | Mean | Geometric |
| Good | (Survey) | Overall | Neutral | Happy | Sad | Overall | Neutral | Happy | Sad | | | | |
| Time | Cruise | 1,08 | 0,91 | 1,20 | 1,13 | 0,99 | 0,72 | 1,40 | 1,00 | 7,17* | - | - | 3,93 |
| | Movie | 0,94 | 0,95 | 0,79 | 0,99 | 0,97 | 0,88 | 0,84 | 1,13 | | | | |
| Lotteries | Lottery | 1,76 | 1,97 | 1,55 | 2,18 | 1,74 | 2,02 | 1,79 | 1,50 | 2,10 | - | - | 1,56 |
| Ordinary private good | Coke | 1,23 | 1,33 | 1,24 | 1,11 | 1,14 | 1,14 | 1,21 | 1,05 | 2,92 | - | - | 1,63 |
| | Mug | 1,08 | 1,03 | 1,05 | 1,07 | 1,05 | 1,01 | 0,95 | 1,06 | | | | |
| | n | 118 | 42 | 35 | 41 | 118 | 42 | 35 | 41 | N 46/25/59** | | | N 28/13/3** |

*public/ non-market **number of studies

**Table 8, WTA-WTP ratio comparison to previous studies**

The Table is organized in a way to allow for direct comparison of our results, mood treatment specific and overall, with the aggregate findings of the two meta-analyses. Our approach is novel because we display the ratio under mood individually, allowing for the immediate observation of mood effects. Horowitz and McConnell (2002) calculated the mean $\overline{\mathrm{WTA}}/\overline{\mathrm{WTP}}$ ratio for studies up to 2002, weighted by the number of studies on a specific type of good. As mentioned above, Tuncel and Hammitt (2013) use newer studies for their meta-analysis. Further they take a different approach in quantifying the ratio by using weighted aggregate geometric mean instead of the arithmetic mean. Due to the nature of meta-analyses

and to allow for easier comparison, the authors categorizes the studies goods by type of good. Several types of goods are reported, we focus on the following three categories: Time, which accounts for leisure and vocational goods, Lotteries, by name includes lotteries and any type of private good available for purchase to society called ordinary private goods. Applying these categories on our survey data, we designate both the boat cruise and movie tickets as time goods. The cola bottle and university mug are ordinary private goods. Unsurprisingly the lottery ticket falls under the lotteries category. The higher the ratio, the larger the disparity between minimum willingness-to-accept and maximum willingness-to-purchase. Underlined ratios indicate the largest disparity in the respective good or category. We observed the WTA-WTP gap in 4 out of 5 goods based on mean prices, with no observed gap for the movie ticket. The largest observed mean ratio is found for the lottery under the sad treatment with a value of 2.18. This translates to mean WTA prices being value more than twice as high as WTP prices. It is evidenced that the ratio is highest for lottery tickets considering all other goods in any treatment. For the boat cruise the highest ratio (1.2) is found in the happy treatment group, i.e. WTA prices being valued 20% more than WTP prices. With a ratio of 1.33, the highest ratio for Cola bottles is reported by the neutral treatment. The last gap takes the value of 1.07 for the university mug in the sad treatment. When compared to ratios reported by Horowitz and McConnell (2002) we observe that our ratios are smaller than theirs. For public, non-market goods in which they include leisure goods, they report a mean ratio of 7.17 taking into account 46 previous study on the topic. In our sample we barely observe a gap for these types of goods. Overall mean ratio for the boat cruise is reported to be 1.08 and for the movie we actually find an inverse ratio of 0.94. For lotteries they report an average ratio of 2.1, our overall mean is slightly lower at 1.76. It appears that this relationship of WTA and WTP still holds. For ordinary private goods their ratio is estimated to be 2.92, whereas our values for the cola bottle is 1.23 and for the university mug 1.08. Our main observation that our observed $\overline{WTA}/\overline{WTP}$ ratios are lower than those found 14 years ago confirms previous findings by Tuncel and Hammitt (2013). We can also confirm that the gap is good specific as well as dependent on the individual's mood.

To investigate how our results compare to Tuncel and Hammitt (2013), we calculate geometric mean ratios for our data. The main difference between arithmetic and geometric mean estimation is, apart from the mathematical method, the fact the zero responses have to be excluded. This has a visible effect on our results, see Table 8. We now observed the disparity for all goods, including the previously inverse ratio for the movie ticket. Again the

highest ratio is observed for the lottery ticket at 2.02, however this time it's in the neutral treatment group. The second highest ratio is calculated to be 1.4 for the boat cruise under the happy treatment. The second time category item, the movie ticket has a ratio of 1.13 for participants in the sad treatment. Our highest ratio for the cola bottle takes value 1.21 in the happy treatment. Finally, the largest observed geometric mean for the university mug is attributed to the sad treatment group with a value of 1.06. For the time and ordinary private good categories, we observe lower geometric mean values than those found by Tuncel and Hammitt (2013). They find a high ratio of 3.93 for time goods, whereas our overall geometric mean for the boat cruise is 0.99 and 0.97 for the movie ticket. For ordinary private goods they state a ratio of 1.63, which in our case only takes values of 1.14 for the cola bottle and 1.08 for the university mug. Interestingly we observed a larger ratio for the lottery ticket. Our overall geometric mean ratio is reported at 1.74, while the authors only find a ratio of 1.56. It appears that overall our participants either state lower minimum WTP or higher WTA prices for risky lotteries. This is in line with our findings in section 5.2.2 where we attest higher risk seeking preferences for our respondents. In total Tuncel and Hammitt (2013) analyzed 44 studies for goods in the 3 categories.

# 6. Conclusion

The aim of this thesis was to identify the role of different mood states on an individuals so-called minimum willingness-to-accept and maximum willingness-to-purchase prices for a number of goods. We obtain WTA-WTP ratios from our experimental design and compare it with previous, non-mood, studies. We give a short introduction to general WTA and WTP theory, followed by a more specific introduction to WTA-WTP literature in the mood context and a summary of literature studying the use of online study participant recruitment tools. We find that previous studies focused on researching participants either in a happy state or a sad state. No study to our knowledge has combined both happy and sad mood in one, nor elicited prices for multiple goods in this context. Two studies inducing sadness (Lerner et al., 2004; Lin et al. 2006), find that the WTA-WTP gap is not observed for participants in a sad mood. Lerner et al. (2004) actually find a reversed gap in this state of mood, which shows as WTP prices exceed WTA prices. Regarding studies that induce a positive mood on their subjects in the WTA-WTP context, we mention both Lahav and Meer (2012) and Georgantzis and Navarro-Martinez (2010). In both studies the authors observed significantly increased WTA prices for happy subjects as compared to mood neutral ones. In addition to increased WTA

prices, Lahav and Meer (2012) also find increased WTP prices in the happy state of mood. Based on these previous findings, we hypothesize that participants in a sad mood should exhibit increased WTP prices and no disparity. For participants in a happy state, we should observe increased WTA prices and in some cases increased WTP. What should be clear already is the fact that a participant's mood leads to prices significantly deviating from fundamental neutral mood values.

We use the online participant recruitment tool Crowdflower in order to attract 150 US American participants to take part in our survey. After successful recruitment we let our subjects randomly watch one out of three short films, meant to induce a specific mood: happiness, sadness and neutrality. To verify whether the participants paid attention to each film and the mood induction thus worked as intended, we ask five questions on the context of each film following its screening. Based on these questions, we remove all participants with less than three correctly answered context questions. We attest our participants to have paid great attention to our films with on average four out of five questions answered correctly. Following the context questions, we randomly elicit WTA or WTP prices for 5 goods along a preset price scale from zero dollars to individual maximum prices. In the next step we apply the PANAS (Watson et al., 1988) mood questionnaire which allows us to calculate each subject's positive and negative affect score. Lastly, we collect some background information such as age, education and employment statues from the individual. Participation is compensated with a fixed payment of $0.35 for completing the survey and an additional $0.15 for answering the context question correctly. Section 3 provides the survey design in detail. Having collected all 154 responses, we had to correct some of our data which resulted in the exclusion of 26 observations. The loss is attributed to 20 cases in which the survey was not fully completed and another six cases with context question scores below our threshold. In total, we have 118 observations, which consist of 60 WTA and 58 WTP responses. Our mood treatment groups consist of 41 sadness, 35 happiness and 42 neutrality observations. Respondents' characteristics vary from below the age of 20 years to older than 60 years and from students to retired individuals.

For our main empirical analysis, we firstly analyze and conduct a classic t-test on our observed mean positive and negative affect scores for both the happiness and sadness treatment. We compare our individual mood specific scores to both our neutral mood results and the original scores from Watson et al. (1988). Immediately, we find that our positive

affect scores are significantly higher than those observed by Watson, whereas the negative affect scores are at comparable levels. More importantly for our further empirical model, we find that participants in our happy treatment group exhibit higher positive affect and lower negative affect scores compared to our sad treatment group participants. Further, we find lower negative affect scores in our happiness than in our neutrality treatment. However, we observe higher positive affect scores in our neutral treatment than happy group. Considering all observations, we argue that our mood induction was successful for both happiness and sadness treatments. T-test results comparing the mean affect scores between groups are insignificant. These results are not surprising as PANAS scores are known to only slightly deviate from the mean, as evidenced from comparable original PANAS scores from 1988 and ours. In the next step, we establish a statistical model to identify the determinants of observed WTA and WTP prices in our sample. Our data is left censored due to zero responses and right censored, due to some maximum responses, which is typical for WTA and WTP studies. Thus, we had to choose an appropriate model. For WTA prices as the dependent variable we use a Tobit model and a truncated regression model for WTP prices. For our first model, we create a variable called mood, which is meant to indicate how happy or sad a person reports himself to be at the time of asking. We deduct the negative affect scores from the person's positive affect score. Therefore, the higher the variable the happier the person. We run a regression for each of our five goods. We observe that a positive mood increases WTP prices for movie tickets and decreases WTA prices for lottery tickets. For other goods we find no significant effects of the mood. We do observe that the determinants for WTP are significantly different from the ones for WTA prices. Variables such as age, education and employment determine WTP prices for certain goods. For WTA prices the most important determinants are familiarity with the films shown and experience in pricing the products. Already in our first model, we find that mood has an influence on WTA and WTP prices. However, these effects only hold for certain goods. We investigate the specific mood states, happiness and sadness, as separate factors in the next model. We create two dummy variables, which indicate whether an individual is happier or sadder compared to the control group average. All other factors remain the same in this model. We again take WTP or WTA prices as dependent variables and run a model for each good. While most background variables such as age etc. remain significant at similar levels as in the mood variable model, we only find statistically significant sadness and happiness estimates in the WTP domain. Again we observe that mood influences prices of only certain goods. Participants decrease their maximum willingness-to-purchase prices for movie tickets when they are sadder than the

average respondents. Surprisingly, the same respondents are willing to pay significantly higher WTP prices for lottery tickets. We argue that sadness reduces the desire for purchasing common leisure goods but increases the preference for risky gambles. The increased risk seeking behavior under a sad mood confirms the mood maintenance hypothesis. Focusing on happy subjects, we find increased WTP prices over all goods, with high statistical significance for the lottery and cola bottle. This finding confirms previous findings of happiness increasing WTP, see Lahav and Meer (2012). As mentioned before it appears that mood does not have an impact on WTA prices in our sample. Significant factors in the WTA domain are education, familiarity with the films and familiarity with pricing the goods. A robustness test applied on the original PANAS affect scores confirms our regression results.

Lastly, we calculate the WTA-WTP ratio, on both arithmetically and geometrical mean observations. Comparing our ratios to Horowitz and McConnell (2002) we find that our ratios are significantly smaller than theirs. The largest mean ratio in our sample is found for the lottery ticket under the sad treatment and the smallest, inverse ratio is observed for the movie ticket in the happy mood. Reaching the same conclusion as the authors we argue that the gap is highly good dependent. Overall we observe the gap in four out of five goods, the movie ticket being the only non-gap one. Using geometric mean ratios, we remove all zero observations from our data and allow for comparison with Tuncel and Hammitt (2013). Our time and ordinary private good ratios are slightly lower than theirs. In the case of the lottery ticket we observe a ratio exceeding theirs, which confirms that our respondents are more risk seeking compared to theirs. A possible explanation of why our ratios are lower than the previous ones, apart from the finding of decreasing ratios over time, could lie in the very nature of the study. We focus specifically on the influence of mood and choose to induce both happiness and sadness, thus focusing on two extreme values. Our ratios suggest that both happy and sad treatment ratios are exceeding the neutral treatment ones, however because our data is not completely equally distributed over the groups we put more weight on neutral group observations. We also have to consider that previous studies did not induce mood and therefore should differ from our results.

To conclude this thesis, we argue that mood has an impact on both WTA and especially WTP prices. When separating happiness and sadness into two distinct affect states, we only find mood to be influential in the WTP domain. Happiness appears to increase WTP whereas sadness decreases WTP for time and leisure goods. For risky goods such as lotteries,

happiness leads our participants to increase their maximum WTP and thus the willingness-to-purchase goods. This finding confirms previously documented theories of happiness increasing risk seeking behavior. Other important determinants of WTP are gender, education and the individual's employment status. For WTA prices the most important factors are subject's familiarity with the videos shown and experience in pricing the goods. Our hypotheses regarding whether AIM or MMH are the most suitable framework for estimating the influence of mood on WTA or WTP prices cannot be answered satisfyingly. Our analysis suggests that these models only hold as a generalization but do not account for the largest source of good specific variation. This study is the first to focus on three mood states in one survey: happiness, sadness and neutrality. We add to the small number of existing studies on this relevant topic, which should receive further attention in future research. We suggest using a similar methodology on even broad numbers of participants and also to study the responses of individuals from different geographical areas outside the United States. Another possibility for future research would be to change the films shown and see if the results are robust across videos or if the mood induction worked as expected. To receive statistically significant mood induction results we recommend measuring the subject's mood twice, once before the film and once after the price elicitation task. The WTA-WTP gap proves still to be difficult to fully explain. So far we know for certain, that it decreases over time, it is goods specific and a robust finding over many studies. This thesis proves further that behavioral aspects such as the individual's mood also play an important role and have to be included in future research.

# Appendix

# A Descriptive statistics

| Variable | Obs | Mean | Std. Dev. | Min | Max |
|---|---|---|---|---|---|
| wta1 | 60 | 3.908333 | 2.221794 | .5 | 10 |
| wta2 | 60 | 7.783333 | 3.589493 | 0 | 18 |
| wta3 | 60 | 23.58333 | 22.81636 | 0 | 88 |
| wta4 | 60 | 1009.517 | 486.1939 | 7 | 2000 |
| wta5 | 60 | 1.658333 | 1.446596 | 0 | 7.2 |
| wtp1 | 58 | 3.608621 | 2.033085 | 0 | 8 |
| wtp2 | 58 | 8.258621 | 3.654175 | 2 | 15 |
| wtp3 | 58 | 13.41379 | 14.01507 | 0 | 61 |
| wtp4 | 58 | 935.1207 | 446.1291 | 31 | 2000 |
| wtp5 | 58 | 1.343103 | .7716722 | .1 | 5 |
| qscores | 41 | 4.414634 | .6314907 | 3 | 5 |
| qscoreh | 35 | 4.4 | .7745967 | 3 | 5 |
| qscoren | 42 | 4.214286 | .7819835 | 3 | 5 |
| affectpos | 118 | 31.51695 | 9.262306 | 10 | 50 |
| affectneg | 118 | 14.94915 | 6.739154 | 10 | 33 |
| gender | 118 | .440678 | .4985856 | 0 | 1 |
| ntongue | 118 | .9576271 | .2022974 | 0 | 1 |
| age | 118 | 3.127119 | 1.26455 | 2 | 6 |
| educ | 118 | 2.822034 | .8636175 | 1 | 5 |
| job | 118 | 2.881356 | 1.503099 | 1 | 6 |
| familiar_v~o | 118 | 4.220339 | 1.170401 | 1 | 5 |
| familiar_p~g | 118 | 3.881356 | 1.110705 | 1 | 5 |

**Table 9, Descriptive statistics of survey data**

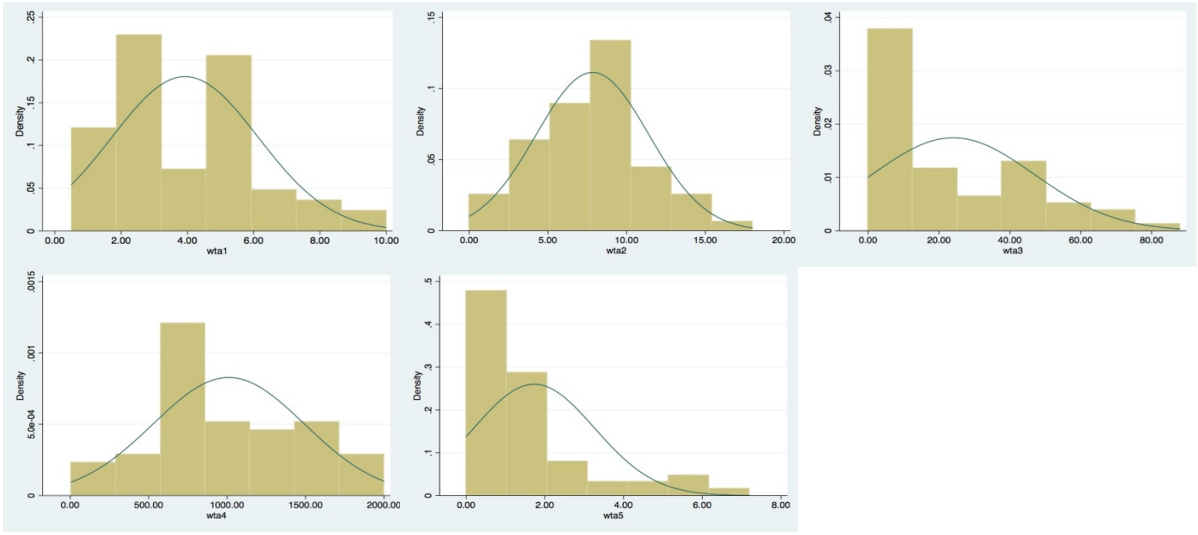



**Figure 5, Histograms of WTA prices**

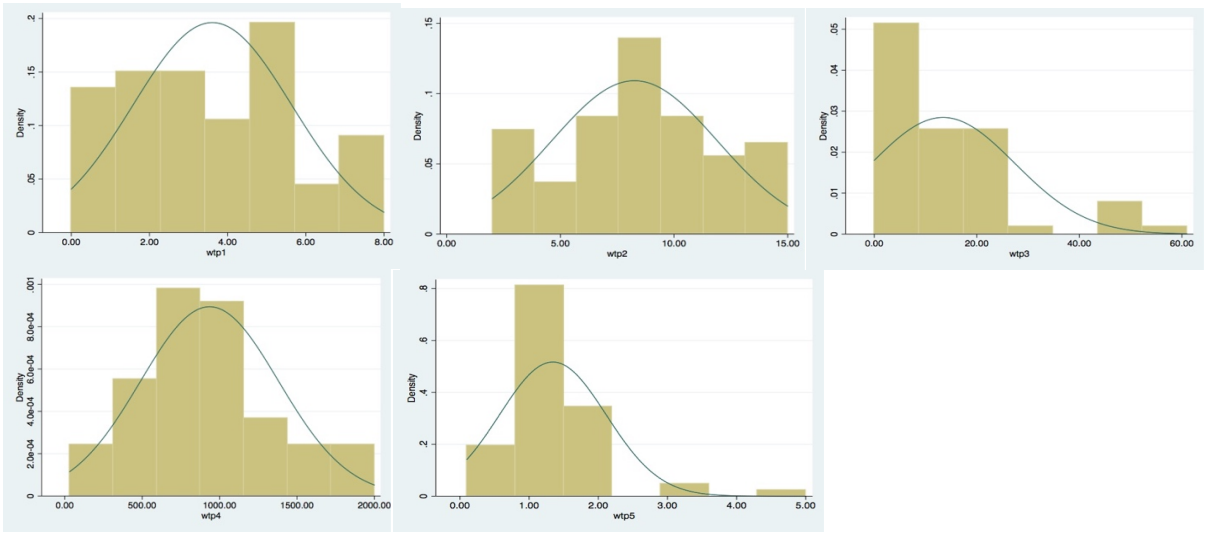



**Figure 6, Histograms of WTP prices**

# B Empirical results

WTP – Original PANAS score

| | (1) wtp1 b/se | (2) wtp2 b/se | (3) wtp3 b/se | (4) wtp4 b/se | (5) wtp5 b/se |
|---|---|---|---|---|---|
| **eq1** | | | | | |
| saddum1 | 0.143 | −2.402* | 18.64* | −79.70 | −0.380 |
| | (0.820) | (1.245) | (10.671) | (147.987) | (0.423) |
| happydum1 | 0.374 | 1.459 | 16.91 | 153.4 | 0.848** |
| | (0.789) | (1.189) | (10.653) | (146.741) | (0.430) |
| Gender | −0.206 | −1.647 | 23.38** | −33.43 | −0.384 |
| | (0.845) | (1.274) | (11.733) | (153.752) | (0.440) |
| Age | 0.221 | 0.378 | −4.513 | −39.00 | −0.0982 |
| | (0.307) | (0.463) | (4.307) | (58.111) | (0.166) |
| Education | 0.492 | −1.377** | 11.76** | −27.11 | −0.241 |
| | (0.451) | (0.677) | (5.786) | (80.293) | (0.222) |
| Job | −0.0680 | 0.603 | 2.990 | 246.5** | 0.222 |
| | (0.583) | (0.849) | (9.780) | (119.081) | (0.298) |
| Familiarity w/ Video | 0.380 | 1.099 | −4.120 | 77.43 | 0.00280 |
| | (0.546) | (0.802) | (5.584) | (94.893) | (0.249) |
| Familiarity w/ Pricing | −0.184 | −1.050 | 7.692 | −24.61 | −0.312 |
| | (0.558) | (0.835) | (6.349) | (98.208) | (0.269) |
| Constant | 0.129 | 9.914*** | −69.05* | 369.4 | 2.745** |
| | (2.444) | (3.505) | (39.740) | (434.015) | (1.117) |
| **sigma** | | | | | |
| Constant | 2.053*** | 3.315*** | 15.91*** | 387.1*** | 0.929*** |
| | (0.321) | (0.423) | (3.890) | (56.025) | (0.169) |
| Observations | 40 | 40 | 40 | 38 | 40 |

dependent variable: WTP, dropped variable ntongue; only happy and sad treatment groups

**Table 10, Robustness check WTP - Original PANAS scores**
**Dependent variables are: wtp1 – university mug, wtp2 – movie ticket, wtp3 – lottery, wtp4 – boat cruise and wtp5 – cola bottle**

WTA – Original PANAS score

| | (1) wta1 b/se | (2) wta2 b/se | (3) wta3 b/se | (4) wta4 b/se | (5) wta5 b/se |
|---|---|---|---|---|---|
| **model** | | | | | |
| saddum1 | 1.106 | 0.667 | 10.00 | 144.1 | −0.334 |
| | (0.940) | (1.244) | (8.198) | (189.964) | (0.406) |
| happydum1 | −0.635 | 0.412 | 1.612 | −36.51 | −0.414 |
| | (0.913) | (1.214) | (8.057) | (185.102) | (0.396) |
| Gender | 0.370 | −1.204 | 3.634 | −24.15 | 0.493 |
| | (0.862) | (1.147) | (7.553) | (174.286) | (0.374) |
| Age | −0.642 | −0.603 | −1.919 | −60.38 | −0.109 |
| | (0.417) | (0.554) | (3.679) | (84.845) | (0.181) |
| Education | −0.590 | 0.394 | 8.622* | 164.3 | 0.0840 |
| | (0.531) | (0.705) | (4.672) | (109.072) | (0.230) |
| Job | 0.740 | −0.580 | 1.278 | −163.9 | 0.195 |
| | (0.557) | (0.740) | (4.900) | (116.120) | (0.241) |
| Familiarity w/ Video | 0.349 | 1.113* | −6.215 | 109.6 | −0.428** |
| | (0.429) | (0.570) | (3.763) | (86.900) | (0.186) |
| Familiarity w/ Pricing | −0.654 | −1.070* | −1.210 | −73.56 | −0.0300 |
| | (0.407) | (0.540) | (3.558) | (82.559) | (0.176) |
| Constant | 7.223*** | 8.773** | 27.95 | 921.1* | 3.275*** |
| | (2.509) | (3.319) | (21.934) | (506.089) | (1.081) |
| **sigma** | | | | | |
| Constant | 2.157*** | 2.865*** | 18.89*** | 436.0*** | 0.935*** |
| | (0.260) | (0.346) | (2.304) | (53.763) | (0.110) |
| Observations | 36 | 36 | 36 | 36 | 36 |

dependent variable: WTA, dropped variable ntongue; only happy and sad treatment groups

**Table 11, Robustness check WTA - Original PANAS scores**
**Dependent variables are: wta1 – university mug, wta2 – movie ticket, wta3 – lottery, wta4 – boat cruise and wta5 – cola bottle**

One-sample t test

| Variable | Obs | Mean | Std. Err. | Std. Dev. | [95% Conf. Interval] |
|---|---|---|---|---|---|
| affec~ss | 41 | 31.34146 | 1.244309 | 7.967464 | 28.82662 33.85631 |

mean = mean(affectposs) t = -0.3685
Ho: mean = 31.8 degrees of freedom = 40

Ha: mean < 31.8 Ha: mean != 31.8 Ha: mean > 31.8
Pr(T < t) = 0.3572 Pr(|T| > |t|) = 0.7144 Pr(T > t) = 0.6428

**Table 12, T-test of mood - Positive affect score of sad treatment group**

One-sample t test

| Variable | Obs | Mean | Std. Err. | Std. Dev. | [95% Conf. Interval] |
|---|---|---|---|---|---|
| affec~sh | 35 | 31.37143 | 1.915477 | 11.33211 | 27.47871 35.26415 |

mean = mean(affectposh) t = -0.2237
Ho: mean = 31.8 degrees of freedom = 34

Ha: mean < 31.8 Ha: mean != 31.8 Ha: mean > 31.8
Pr(T < t) = 0.4121 Pr(|T| > |t|) = 0.8243 Pr(T > t) = 0.5879

**Table 13, T-test of mood - Positive affect score of happy treatment group**

One-sample t test

| Variable | Obs | Mean | Std. Err. | Std. Dev. | [95% Conf. Interval] |
|---|---|---|---|---|---|
| affec~gs | 41 | 15.04878 | .9265404 | 5.932753 | 13.17617 16.92139 |

mean = mean(affectnegs) t = 0.0850
Ho: mean = 14.97 degrees of freedom = 40

Ha: mean < 14.97 Ha: mean != 14.97 Ha: mean > 14.97
Pr(T < t) = 0.5337 Pr(|T| > |t|) = 0.9327 Pr(T > t) = 0.4663

**Table 14, T-test of mood - Negative affect score of sad treatment group**

One-sample t test

| Variable | Obs | Mean | Std. Err. | Std. Dev. | [95% Conf. Interval] |
|---|---|---|---|---|---|
| affec~gh | 35 | 14.8 | 1.275365 | 7.545158 | 12.20815 17.39185 |

mean = mean(affectnegh) t = -0.1333
Ho: mean = 14.97 degrees of freedom = 34

Ha: mean < 14.97 Ha: mean != 14.97 Ha: mean > 14.97
Pr(T < t) = 0.4474 Pr(|T| > |t|) = 0.8947 Pr(T > t) = 0.5526

**Table 15, T-test of mood - Negative affect score of happy treatment group**

Kruskal-Wallis equality-of-populations rank test

| treatm~t | Obs | Rank Sum |
|---|---|---|
| 1 | 42 | 2519.50 |
| 2 | 41 | 2350.50 |
| 3 | 35 | 2151.00 |

chi-squared = 0.288 with 2 d.f.
probability = 0.8658

chi-squared with ties = 0.289 with 2 d.f.
probability = 0.8656

**Table 16, Kruskal-Wallis on positive affect scores**

Kruskal-Wallis equality-of-populations rank test

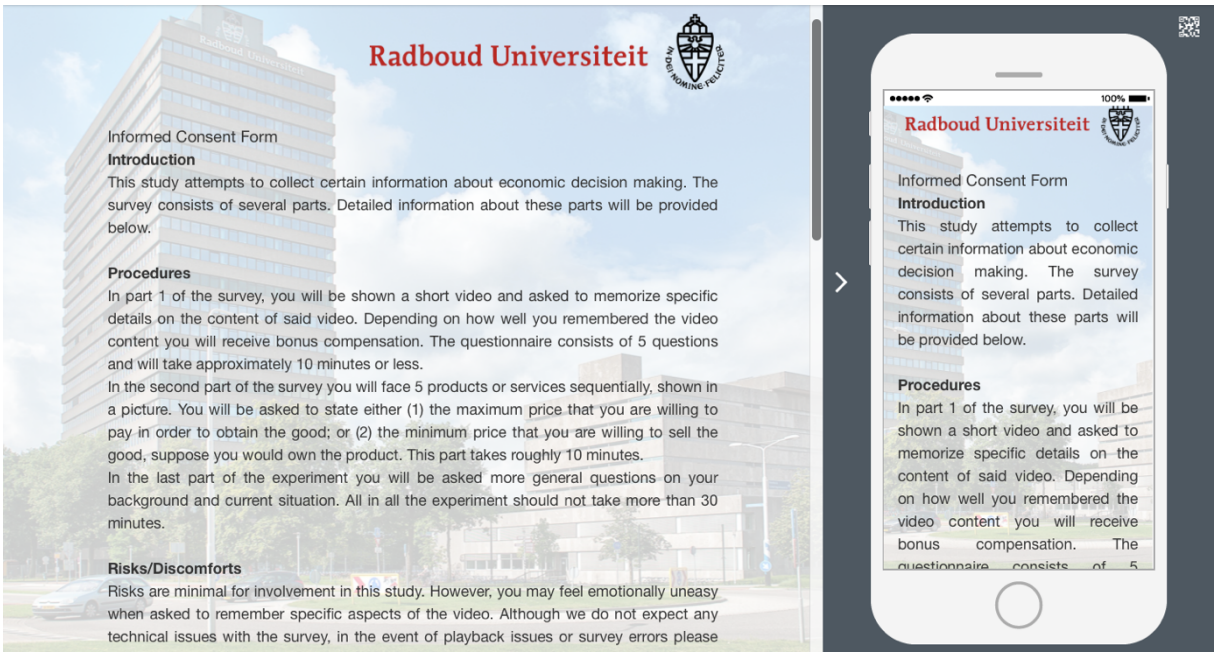
| treatm~t | Obs | Rank Sum |
|---|---|---|
| 1 | 42 | 2508.00 |
| 2 | 41 | 2604.50 |
| 3 | 35 | 1908.50 |

chi-squared = 1.308 with 2 d.f.
probability = 0.5199

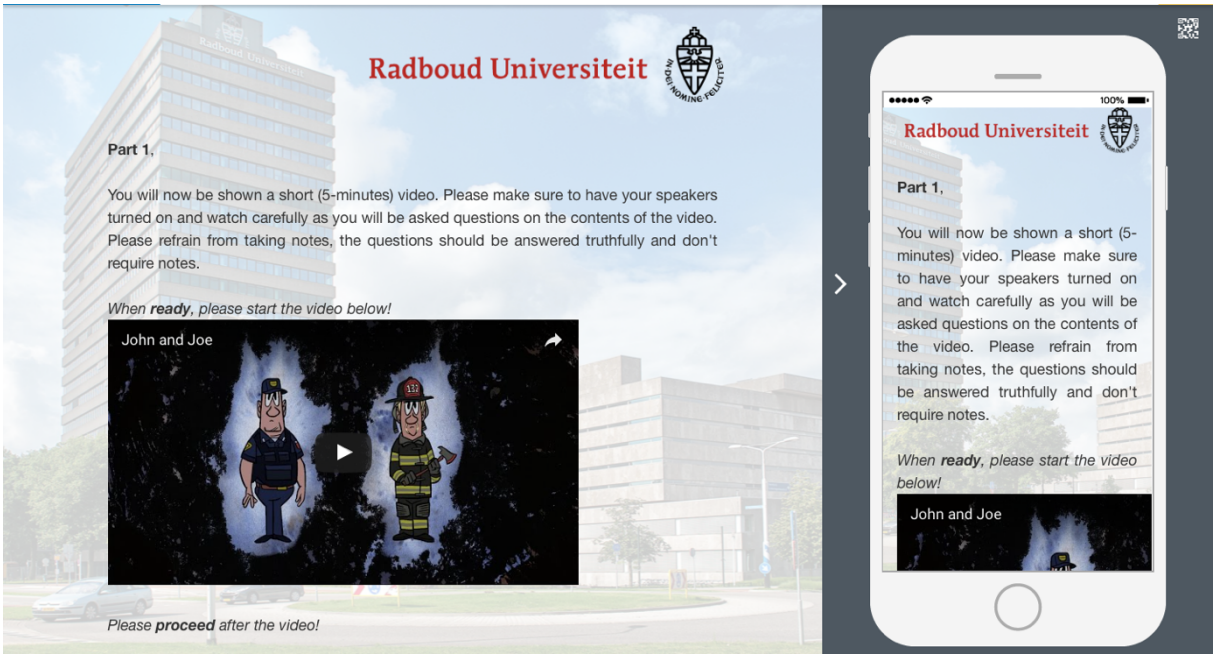
chi-squared with ties = 1.379 with 2 d.f.
probability = 0.5018

**Table 17, Kruskal-Wallis on negative affect scores**

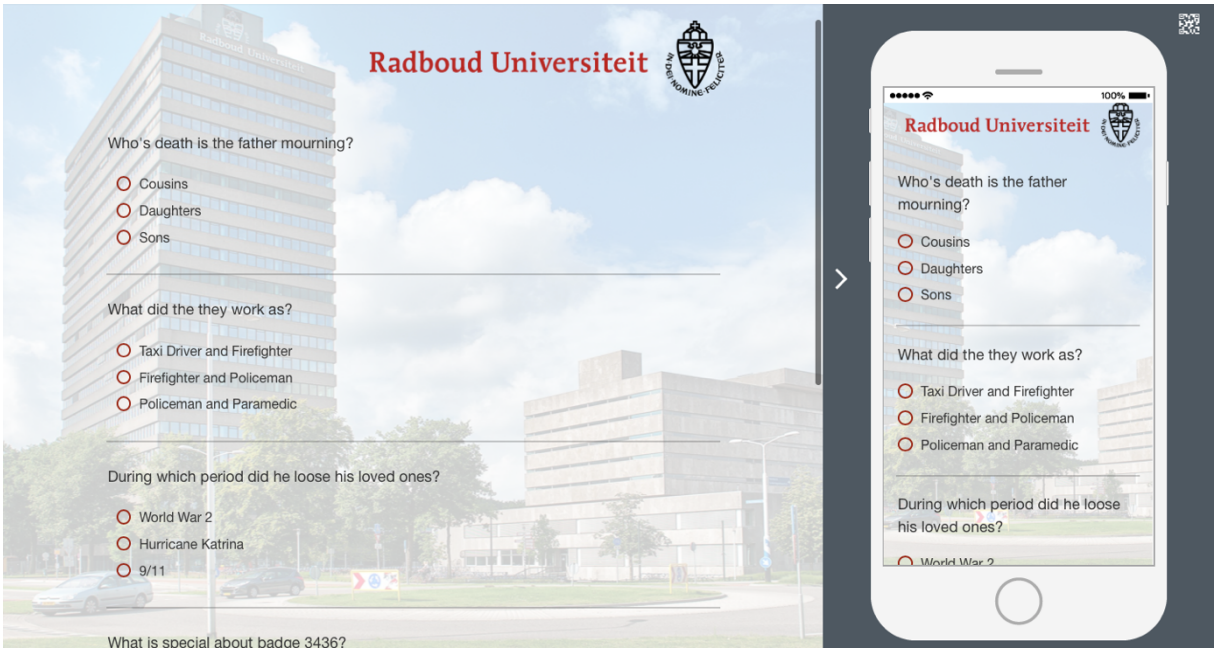
# C Survey design




**Online survey 1, Informed consent form**

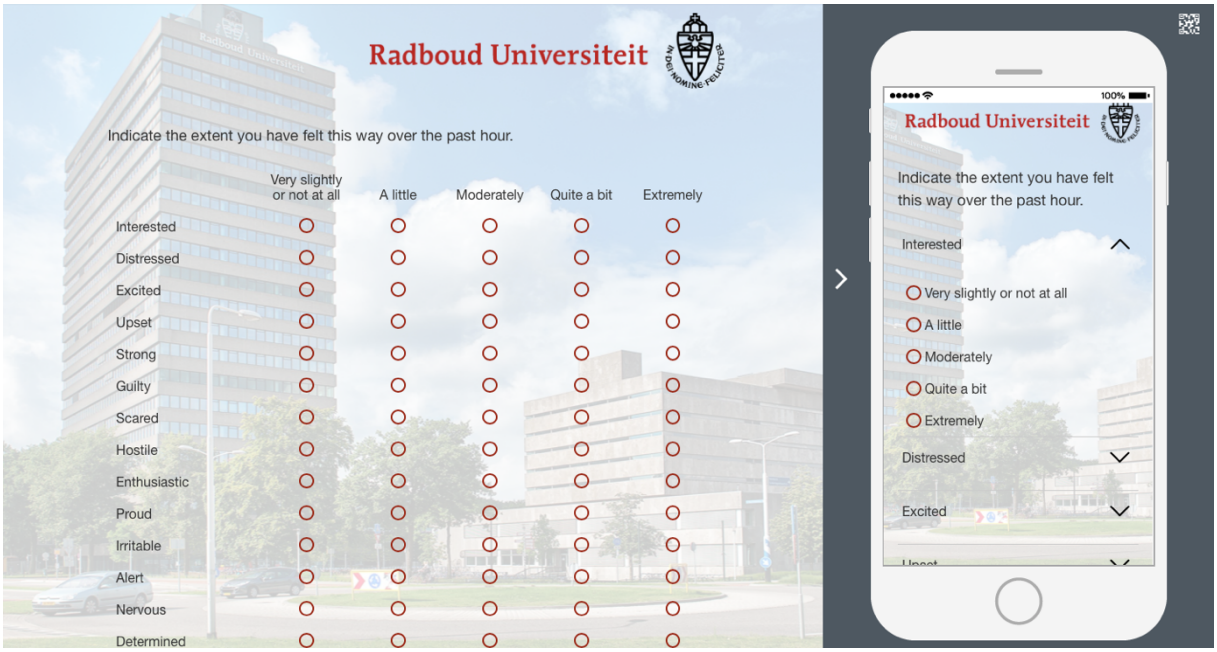



**Online survey 2, Example of video screen**

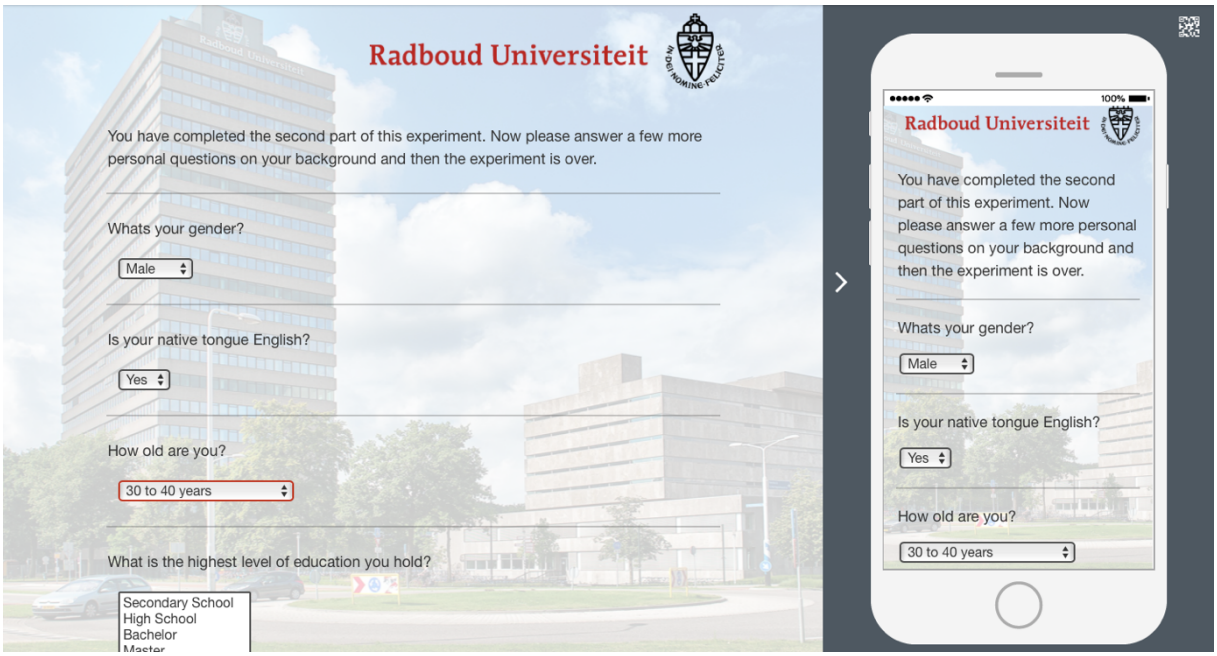



**Online survey 3, Example of video content questions**

**Online survey 4, Example of price elicitation screen**




**Online survey 5, PANAS questionnaire**




**Online survey 6, Part of background questions**

# D Descriptions of variables used in regression model

Dependent variables:

| | |
|---|---|
| wta1 | WTA price for Radboud mug |
| wta2 | WTA price for movie ticket |
| wta3 | WTA price for lottery |
| wta4 | WTA price for boat cruise |
| wta5 | WTA price for cola bottle |
| | |
| wtp1 | WTP price for Radboud mug |
| wtp2 | WTP price for movie ticket |
| wtp3 | WTP price for lottery |
| wtp4 | WTP price for boat cruise |
| wtp5 | WTP price for cola bottle |

Independent variables:

| | |
|---|---|
| age | age group of participant |
| mood | mood scale created by subtracting a participant's negative affect score from the positive one |
| saddum1 | takes value 1 if negative affect score is higher than the original score (14.8) or 0 |
| happydum1 | takes value 1 if positive affect score is higher than the original score (29.7) or 0 |
| saddum | takes value 1 if positive affect score is higher than the neutral group average (14.97) or 0 |
| happydum | takes value 1 if positive affect score is higher than the neutral group average (31.8) or 0 |
| gender | gender of participant |
| educ | highest achieved education level of participant |
| jobcat | employment status of participant |
| familiar_video | participant's familiarity with mood video on 5-point scale |
| familiar_pricing | participant's familiarity with pricing the goods on 5-point scale |

Other

| | |
|---|---|
| affectposh | participants positive affect score under happy treatment |
| affectposs | participants positive affect score under sad treatment |
| affectnegh | participants negative affect score under happy treatment |
| affectnegs | participants negative affect score under sad treatment |
| qscores | number of sad video content questions answered correctly |
| qscoreh | number of happy video content questions answered correctly |
| qscoren | number of neutral video content questions answered correctly |
| affectpos | participants positive affect score |
| affectneg | participants negative affect score |
| ntongue | takes value 1 if participants mother tongue is English or 0 |
| treatment | indicates the subject's treatment (1=neutral, 2=sad, 3=happy) |

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