ERASMUS UNIVERSITY ROTTERDAM

Erasmus School of Economics

Bachelor Thesis

Ambiguity Attitudes: Self – Other Differences and Altruism

The self-other discrepancy in ambiguity attitudes in the loss domain

and the influence of altruism on it

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Date final version: 12 July 2019

Abstract

This thesis investigates how ambiguity attitudes differ in situations where individuals must decide for themselves versus for an anonymous stranger, in the loss domain. Furthermore, it looks into how altruism affects this self-other difference. Self-other differences have been well-documented for risk attitudes. For ambiguity attitudes, however, it is still underexplored. Given the similarity of these two kinds of uncertainty, it is expected to find differences in ambiguity attitudes as well. This thesis will focus on the loss domain, which, contrarily to the gain domain, has not been researched before.

On an aggregate level, there is no significant discrepancy found in ambiguity attitudes in the two contexts. However, there is individual heterogeneity found. Circa two-third of the subjects show different ambiguity attitudes. Most of these subjects act more ambiguity averse when deciding for another. Altruism had no significant influence on the discrepancy in ambiguity attitudes. Nevertheless, it was found that equally-oriented subjects are more likely to make the same decisions in self-other situations.

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1. Introduction

When it comes to real-life decision making, there is often uncertainty. According to Knight (1921), there are two kinds of uncertainty: "measurable" and "unmeasurable" uncertainty. Measurable uncertainty, in other words "risk", represents situations in which all relevant probabilities of events are available. Unmeasurable certainty, defined by Ellsberg (1961) as "ambiguity", corresponds to situations in which not all relevant probabilities are known.

People tend to have certain attitudes when facing these situations. "Risk attitudes" are defined as "chosen responses to perception of significant uncertainty" (Hillson & Murray-Webster, 2017, p. 4). Whereas "ambiguity attitude" is the impact on behavior when unknown probabilities are faced, thus, in essence, the impact of the difference between risk and ambiguity. Ellsberg (1961) stated that people generally prefer to bet on risky rather than on ambiguous prospects. This preference is called "ambiguity aversion". Ambiguity aversion can cause preferences to be inconsistent with the Expected Utility Theory. If assumed that this theory is the rational standard, ambiguity aversion could negatively affect rationality. This could be a highly relevant problem, since many uncertain real-life decisions are prone to this aversion.

Continuously, important decisions are made for anonymous individuals: producers decide for their consumers, companies decide for their customers and politicians decide for an entire population. In a situation where an individual or entity can make decisions on behalf of, or that impact, another person or entity, the principal-agent problem can occur (Grossman & Hart, 1992). This problem arises when the interests of the parties are different, in an environment with asymmetric information. This situation often leads to inefficiency and not achieving optimal allocation. It is therefore socially relevant to study ambiguity attitudes when deciding for anonymous strangers.

Prior literature has shown that *risk attitudes* differ between situations where one must decide for oneself and where one must decide for an (anonymous) other. However, for *ambiguity attitudes*, there is very limited research done concerning this topic. König-Kersting and Trautmann (2016) did not find a self-other discrepancy when testing for gain prospects. There has no research been done for losses. Gains and losses are typically evaluated differently. For instance, contrasting emotions come in play. Hence, the self-other discrepancy is expected to be different as well. Therefore, the first research question of this thesis is stated as follows:

(i) How do ambiguity attitudes differ in the loss domain between deciding for oneself and an anonymous stranger?

In cases of decision making for *oneself*, involving pure loss prospects, most individuals tend to be *risk averse*, depending on their utility curvature and probability weighting function. Chakravarty et al. (2011) and Pahlke et al. (2015) found that when deciding for *an anonymous stranger*, there is a tendency to act *more risk seeking* than when deciding for oneself. Andersson et al. (2014) explain this riskier behavior by stating that emotions that typically come with facing loss prospects, are reduced. Therefore, individuals care less and act more risk seeking.

Given the similarity of decisions under risk to decisions involving ambiguity, deciding for others instead of for oneself would be expected to have effects in the same direction for ambiguity attitudes (König-Kersting & Trautmann, 2016). Therefore, the following hypothesis is stated in order to address the first research question:

H1: When deciding for another instead of for oneself in the loss domain, *ambiguity seeking* behavior is *increased.*

A possible discrepancy means that there must be factors that make individuals change their attitude when deciding for another. An important factor could be their social preferences. The majority of people exhibit social preferences: they care about others' payoffs, instead of exclusively being motivated by their self-interest (Fehr & Fischbacher, 2002). Social preferences are known to play a role when the pay-offs of others are involved in decision making. Yet, there has no research been done on this role in self-other differences under ambiguity. Presumably the most important social preference in this case is altruism. The more altruistic an individual is, the more equal another's pay-off is valued to one's own, expecting to affect the difference in attitude in self-other contexts. The second research question of this thesis therefore focuses on this factor:

(ii) How does altruism affect the discrepancy in these (self-other) ambiguity attitudes?

Suppose an individual is purely *selfish* and only looks after its own interest. One could then imagine that his evaluation when deciding for himself is different from when deciding for another: where the individual cares about the decision in the first situation, the decision in the latter situation is not of interest. This can lead to different reactions: either the individual acts *more ambiguity seeking* (does not care about the consequences), or, he chooses the same option as he chooses for himself to minimize effort, causing *no difference in attitude*.

Suppose now an *altruistic* individual faces the situation in which he must decide for another in an ambiguous situation. In this case, in contrast with the selfish individual, he cares about the payoff

of the other, and gains utility from it. The more equal he values the outcome of the payoffs, the *smaller the difference* in behavior, and therefore *attitude,* is likely to be.

Because these expectations rise a complicated empirical issue, where there is no easy way to theoretically justify either direction, the second hypothesis is formulated openly:

H2: Altruism influences the self-other discrepancy in ambiguity attitudes.

First, the data and methodology will be described. Then, the hypotheses will be examined in the analysis, of which the results are shown. After addressing the corresponding research questions in the conclusion, the limitations will be discussed.

2. Data and methodology

To address the hypotheses and research questions, an empirical approach is used. Quantitative data is collected through a survey. The survey is distributed via social media applications, to reach a large group. 77 respondents in total completed the whole survey. 58% of the participants is female, the average age is 29 and the median educational attainment is senior general secondary education (table 6, Appendix).

Design of the survey

The survey starts with general questions that later serve as control variables: age, gender and educational attainment. The body of the survey consists out of eliciting altruism and ambiguity attitudes for self and other.

1. *Measuring altruism*

To measure altruism, the dictator game is used (e.g. Forsythe et al., 1994; Camerer & Thaler, 1995; Charness & Rabin, 2002; Eckel & Grossman, 1996; Hoffman et al., 1996). In this game, there are two players: a dictator (proposer), and a receiver. The dictator receives a monetary amount S. The dictator proposes a division of S: (x, S-x), where x is the amount the dictator keeps, and S-x is the amount the dictator gives to the receiver. The receiver cannot reject the proposition. This means the dictator is completely free in his choice of distribution and does not have to take into account that the receiver might reject. This means that there cannot be strategic reasoning behind the act of the dictator. Hence, the game theoretic solution is that the dictator will keep the full amount of S to for himself. However, in practice, not everyone follows this behavior. Some are willing to give up a part of S. The main explanation for this is altruism. Thus, the dictator game can be used to measure altruism among the participants.

In the survey, participants receive a short explanation about the game. Then, they are asked to fill in the amount they would like to offer to the receiver. They can offer anything between €0 and €10, with steps of 10 cents. The higher the amount they fill in, the more altruistic they are assumed to be.

2. Ambiguity attitudes

The next part of the survey aims to measure ambiguity attitude. The principle is based on the design of Ellsberg's experiment (1961).

To the original design of Ellsberg, some adaptations are made. The purpose is continuously to draw a red ball. Participants are asked to choose between drawing a ball from "the risky urn" (known composition) and the "ambiguous urn" (unknown composition). Instead of using prizes (gain domain), hypothetical *losses* will be used. Thus, participants would lose a certain amount of money if they would draw a black ball instead of a red ball. The hypothetical amount that is used is €10, because participants can easily imagine what it is like to lose €10. It is likely to appear as more realistic than hypothetically losing a very large amount. If a red ball would be drawn, €0 euro would be gained/lost.

For every question, the composition (for the risky urn; in terms of black balls) is mentioned and a corresponding image is displayed (see figure 1). This visual representation makes the choice situations clearer and more "tangible" for the participants.

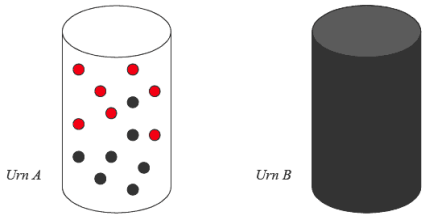

Figure 1: Example of visual representation of the urns: composition 50%-50%

To elicit ambiguity attitudes, the bisection method is used. The diagram is displayed below, in figure 2. Participants will get one binary choice question at a time. Each question is about which urn (risky or ambiguous) they would choose to draw a ball from, if they would have to draw a red ball to not lose money. The ambiguous urn is kept fixed (on an ambiguity-neutral probability of 0.5), while the risky urn varies in losing probabilities.

The first question represents the choice between the urns originally used in Ellsberg: participants must choose between the risky urn with a composition of 50% red balls and 50% black balls, and the ambiguous urn. This corresponds with a losing probability of 0.50 (= p). Suppose the decision maker chooses the risky urn (urn A). The following question then shows the situation in which the risky prospect has a losing probability of 0.55 > 0.5; making it a less attractive option. If the decision maker again picks the risky urn, the losing probability further increases with steps of 0.05. The other way around, if the decision maker chooses the ambiguous urn in the first question, the risky losing probability decreases with steps of 0.05, to make the risky urn more attractive. This will continue until the decision maker switches to the other urn (= *End*, see figure 2).

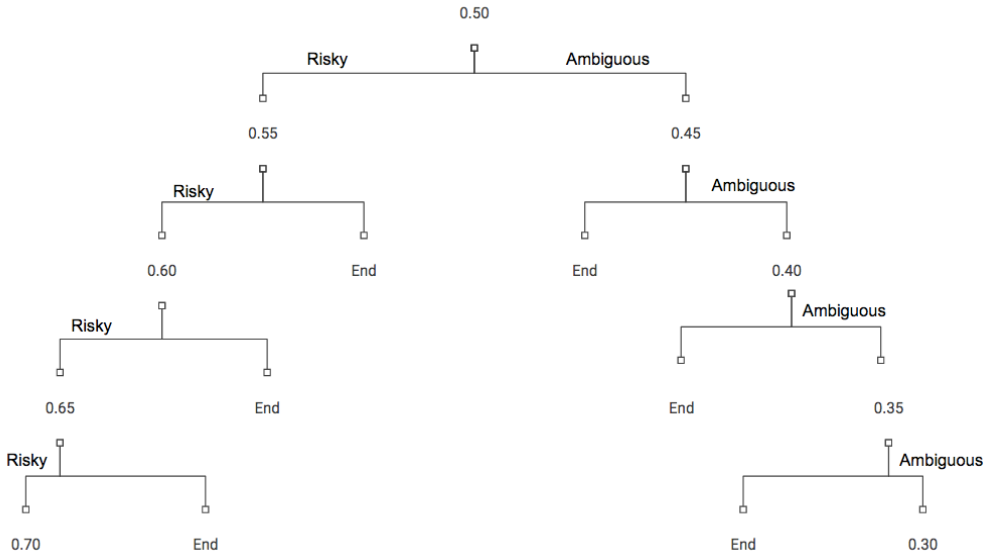

Figure 2: Bisection method to elicit ambiguity attitude[1]

The interest lays in the switching point. Suppose the participant switches to ambiguous for a losing probability of the risky prospect of 0.60. The midpoint between 0.55 (the highest losing probability of the known urn for which is chosen risky) and 0.60 (the lowest losing probability for which is chosen ambiguous) (= 0.575), represents approximately the point of indifference, and therefore the *probability equivalent (PE)* (König-Kersting & Trautmann, 2016). The PE "provides a more fine-grained measure of attitude with more variation and statistical power" compared to the results of the simple, initial choice between the two urns (König-Kersting & Trautmann, 2016, p.4).

In the questions, the probability of losses is elicited. If a participant assigns a higher (subjective) losing probability to the ambiguous prospect, showing *averse* behavior, the PE would be *higher* than 0.5 (the ambiguity-neutral probability). In contrast, if a subject is to be ambiguity seeking, it would attach a lower losing probability to the ambiguous prospect, hence a PE lower than 0.5. Thus, the higher the PE, the more ambiguity averse a subject is.

PE(0.5) < 0.5	Ambiguity seeking
PE(0.5) > 0.5	Ambiguity averse
PE(0.5) = 0.5	Ambiguity neutral

This bisection method is used twice for each participant: once for a situation in which they must decide for themselves (part I), and once in which they must decide for an anonymous stranger (part II). The order of the parts is randomized for each participant. The context (for self or for other) is mentioned prior to the questions.

[1] Note that this is not the complete diagram: the survey continues until the losing probability = 0 or 1.

Variables

Table 1: Variables

Variable	Type	Description
Age	Continuous	Age in years
Gender (female)	Binary	0 = male; 1 = female
Education	Categorical	8 categories (table 7, Appendix)
Altruism	Continuous	Amount given to receiver (0-10)
Ambiguitychosen_self	Binary	Response to first question: 0 = risky; 1 = ambiguous. For self
Ambiguitychosen_other	Binary	"" For other
PE_self	Continuous	Probability equivalents, self
PE_other	Continuous	Probability equivalents, other

Analysis: indexes of ambiguity attitudes

Dimmock et al. (2015), Jaffray (1989) and Kahn and Sarin (1988) used indexes of ambiguity attitudes ("AA indexes") to show the level of ambiguity aversion:

$$AA_p = p - PE(p)$$

Where p is the ambiguity-neutral probability and PE(p) the *probability equivalent.* In this paper, an ambiguity-neutral probability of 0.5 is used (= p). In the questions, the probability of losses is elicited, requiring the PE to be interpreted as: the higher, the more ambiguity averse. Therefore, the ambiguity aversion index is as follows:

$$AA_{0.5} = PE(0.5) - 0.5$$

The higher the PE, the higher the index, the higher the ambiguity aversion. To answer the first hypothesis, the self-other AA indexes will be compared. If the index is significantly lower when deciding for another, the hypothesis is supported. To answer the second hypothesis, the difference between the two indexes of participants will be regressed on the measurement of their altruism. The control variables are included in the model to account for differences in observable characteristics. This gives the following equation:

$$AA_{0.5;\,self} - AA_{0.5;\,other} = \textit{constant} + X_1\,\textit{altruism} + X_2\,\textit{age} + X_3\,\textit{gender} + X_4\,\textit{educational attainment}$$

Depending on the answer to the first hypothesis, the coefficient of altruism will be analyzed in order to answer the second hypothesis.

3. Results

Self-other discrepancy

The share of participants that chose the ambiguous option in the first question (p = 0.5), significantly differs from 0.5, which means that the participants in general are not ambiguity neutral (table 8, Appendix). This applies for deciding for oneself as well as for another. The mean share is 0.351 and 0.364, respectively (table 8, Appendix). This means that on average, participants choose ambiguity seeking for the first binary choice (PE < 0.5).

The bisection method has elicited the probability equivalents. As mentioned before, these can be turned into Ambiguity Attitude indexes through the following formula:

$$AA_{0.5} = PE(0.5) - 0.5$$

The indexes are displayed in table 2, where they are compared to the findings in the gain domain (König-Kersting & Trautmann, 2016). The significance shows whether the indexes significantly differ from 0.5 (point of ambiguity neutrality).

Table 2: Ambiguity Aversion index

	Median	**König-Kersting & Trautmann**	**Mean**	**König-Kersting & Trautmann**
Self	0.025	0.025**	0.028	0.058**
Other	0.025*	0.025**	0.037*	0.032**

*, **, *** denotes significance at 10%, 5%,1%.

The medians of the AA indexes in the paper and this thesis correspond exactly. The means are of similar magnitude. The difference in the indexes of 'Other' seems negligible. For 'Self', the small difference can be interpreted as the respondents of König-Kersting and Trautmann (2016) acting slightly more ambiguity averse. This could perhaps be explained by stating that individuals are marginally more ambiguity seeking for losses, when deciding for themselves. However, since the difference is rather small and moreover the PE found in this paper does not significantly differ from 0.5, one needs to be careful with this statement. Therefore, it cannot be concluded with certainty that, and how, ambiguity attitudes differ between the gain domain and the loss domain.

When testing the similarity of the self-other PE's in this thesis, there is no significant difference found (p-value = 0.264). This means that on the aggregate level, there is no significant self-other discrepancy in ambiguity attitudes. This is in line with the findings of König-Kersting and Trautmann (2016).

However, this does not necessarily mean that there is no discrepancy between the PE's on individual level. As can be seen in the scatterplot of PE Other on PE Self (figure 3), the individual observations are not all on, or close to, the diagonal line (PE_self = PE_other). The correlation between the PE's is low: 0.201. Hence, there is individual heterogeneity. Thus, it is possible that there is a significant discrepancy on individual level. This discrepancy is crowded out on aggregate level.

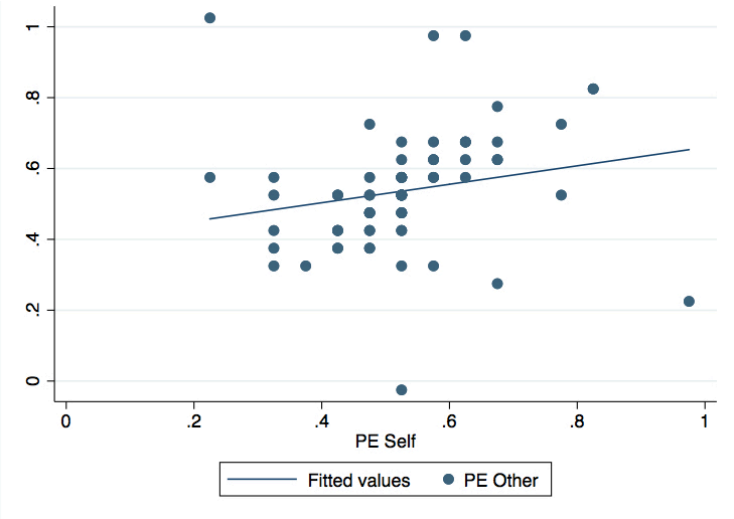

Figure 3: Scatterplot PE other – PE self

When looking at the frequencies of the PE's for Other and Self (table 9 and 10, Appendix), it can be noted that the PE's for Other are more spread out: they are distributed from -0.025 to 1.025, whereas PE Self only has a range of 0.225 to 0.975. On top of that, the PE's for self are more centered around 0.525 (median) than the PE's of other are. This becomes more visible when plotting histograms:

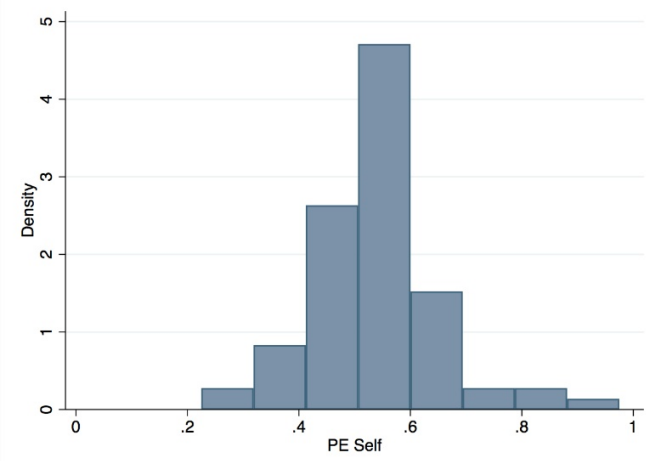

Figure 4: Histogram PE Self

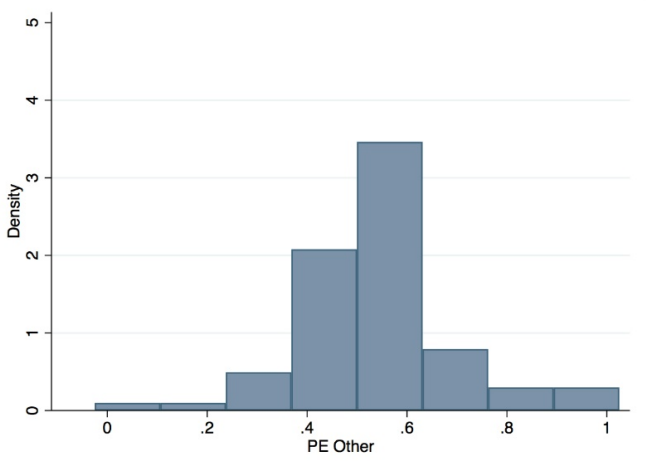

Figure 5: Histogram PE Other

The variance of PE Other is significantly higher (table 11, Appendix). Thus, there are more variabilities when deciding for others. A possible explanation for this is that when deciding for self, most subjects do not (want to) deviate too far from the neutral position, perhaps basing their choices more on rationality, whereas when deciding for others, they (are willing to) show more difference in attitude.

These findings support the statement that on individual level, there are discrepancies between the PE's. The direction of these discrepancies can differ per participant.

To test the individual directions, the difference in AA indexes can be consulted. See the histogram in figure 6. When tabulating, the median is 0, with 32.47% of the participants not distinguishing deciding for self or other (see table 12, Appendix). 37.66% choose in a way that the difference turns out negative. Since AA difference is defined as AA_{self} - AA_{other}, this means that 37.66% of the subjects have a higher PE when deciding for another, thus acting more ambiguity averse. 29.87%, on the other hand, have a positive AA difference and therefore have a lower PE when deciding for another, acting less ambiguity averse. Concluding from these proportions, more than one-third (37.66%) of the subjects, is *more ambiguity averse* when deciding for an anonymous stranger and thus *less ambiguity seeking*.

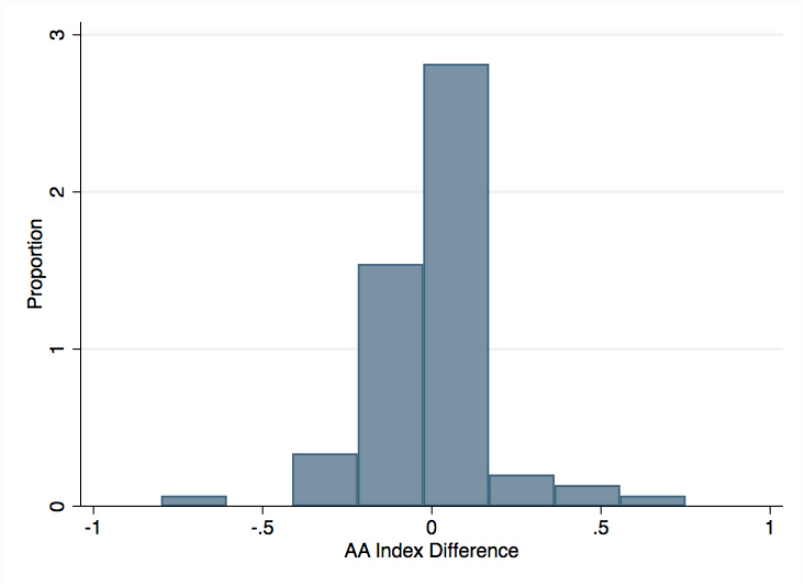

Figure 6: Histogram AA Index Difference

The first hypothesis, which was formulated as "When deciding for another instead of for oneself in the loss domain, ambiguity seeking behavior is *increased*", is *not supported*. There was no significant discrepancy found on an aggregate level, which aligns with König-Kersting and Trautmann (2016). There is heterogeneity on an individual level, where more than one-third of the subjects (38%) attaches a higher PE to deciding for an anonymous stranger, and thus act *less ambiguity seeking*.

Influence of altruism

The average amount given to the receiver in the dictator game is found to be 3.49 euros (table 13, Appendix), which is 35% of the total amount. The most frequently donated amount is 5 euros (35% of the participants) (table 14, Appendix). Only 21% of the respondents is purely selfish, which does not align with the game theoretical expectation, but does align with empirical findings. Forsythe et al. (1994) found that on average 24% is given to the receiver and 30% is selfish. Engel (2011) presented an average donation of 28% and a fraction of selfish participants of 36%. Although the numbers do not exactly match, they are comparable in size.

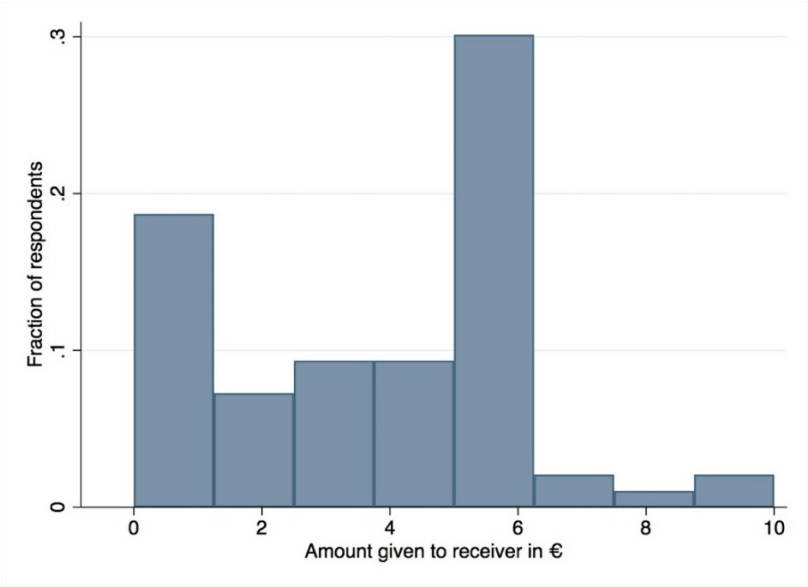

Figure 4: Histogram of altruism

The results that are found when regressing the self-other difference in AA indexes on altruism are summarized in table 4. None of the coefficients turned out to be significant, and thus cannot be interpreted. This means that altruism has no significant influence on the aggregated difference in AA indexes between deciding for oneself and for another.

Table 3: Regression AA difference on altruism

	Coefficient short regression	**Coefficient long regression**
Altruism	-0.009 (0.009)	-0.008 (0.010)
Age		-0.000 (0.002)
Female		-0.007 (0.045)
Education		-0.003 (0.017)
Constant	0.022 (0.037)	0.045 (0.088)

*, **, *** denotes significance at 10%, 5%,1%.

Yet, it is interesting to research the different categories within altruism and the (difference in) decisions of the participants that belong to those categories. The categories specified, based on the amount donated in euros, are shown in table 5. These were generated as binary variables.

Table 4: Categories altruism

Selfish	Donation = 0
Equally divided	Donation = 5
Highly altruistic	Donation > 5

When using these variables in the regression of AA difference on altruism, the following results are found:

Table 5: Regressions AA difference on categories altruism

Selfish	-0.001 (0.055)		
Equally divided		-0.080* (0.048)	
Highly altruistic			0.057 (0.076)
Age	-0.001 (0.002)	-0.000 (0.002)	-0.001 (0.002)
Female	-0.015 (0.045)	0.004 (0.045)	-0.018 (0.044)
Education	-0.002 (0.017)	0.001 (0.017)	-0.001 (0.017)
Constant	0.032 (0.091)	0.018 (0.086)	0.027 (0.087)

*, **, *** denotes significance at 10%, 5%,1%.

The coefficient of equally divided (donation = €5) is found to be the only significant variable, on significance level alpha = 0.10. This can be interpreted as people who like equality more, being more likely to make the same choices for others, when facing ambiguity.

To conclude, there is no significant influence of altruism found on the aggregated self-other discrepancy, meaning the second hypothesis *cannot be supported*. Nonetheless, the results show that the category of people that equally divided the money in the dictator game, are more likely to choose similarly in self-other contexts.

4. Conclusion

The research questions were formulated as follows:

(i) *How do ambiguity attitudes differ in the loss domain between deciding for oneself and an anonymous stranger?*

(ii) *How does altruism affect the discrepancy in these (self-other) ambiguity attitudes?*

At the aggregate level, there was no significant self-other discrepancy in ambiguity attitudes found. However, at the individual level, there is heterogeneity. About two-third of the ambiguity attitudes in this paper differed when deciding for oneself versus for an anonymous stranger, where the most chosen direction (38%) is to act more ambiguity averse when deciding for another.

Altruism had no significant influence on the self-other discrepancy in ambiguity attitudes. Nevertheless, it was found that equally-oriented people are more likely to make the same choices for others as for themselves under ambiguity.

5. Discussion

First, the outcome will be compared to the expectations, and implications will be reviewed. Then, the limitations will be discussed. Lastly, suggestions will be given for future research.

The direction of the individual discrepancy, that most participants act *less ambiguity seeking* when deciding for an anonymous stranger, was not expected, based on the literature. A possible explanation is that these subjects felt responsible and accountable for others' losses, which made them act more carefully. An implication of this behavior, if extrapolated to the population, is that many individuals that need to make decisions that affect strangers, are likely to be ambiguity averse. Thus, if probabilities are unknown, many individuals would act carefully, probably causing decisions to be well-thought-out.

Altruism was expected to have an influence but this could not be found. Next to the limitations that might have caused this, which will be discussed below, it is possibly attributable to the fact that it is a complicated empirical issue. The finding that equally-oriented people are more likely to make the same decisions in self-other contexts, was expectable. As they prefer equality, they act equally in both situations, aiming for equal outcomes. Extrapolating this to the real world, pro-equal individuals that have to make decisions that affect strangers, are likely to decide in the same way as they would for their own. If assumed that people choose for themselves in the best way possible, it would be a positive thing that they would do the same for anonymous others.

The fact that many results were insignificant can possibly be attributed to certain limitations that will now be discussed. First of all, out of 108 respondents, only 77 finished the whole survey. 77 observations are less than optimally desirable for significant results. Secondly, no real incentives were used. Participants could only lose money hypothetically. This could have caused them to act differently than they would in real life. However, one must note that using real incentives for losses is usually unethical, and therefore, even with the necessary resources, could not have been realized. Third, the bisection method might have caused some participants to choose strategically: they observe that as long as they do not switch to the risky urn, the offer gets better – the composition becomes more attractive. This would mean that subjects could choose the ambiguous option more often than their actual preference would suggest, overstating ambiguity seeking behavior. The data showed one subject (out of 77) that might have used this strategy. Lastly, because of the use of the bisection method, mistakes of participants in the beginning are very costly. Participants cannot return to the previous question. These mistakes cannot be observed in the data and therefore it must be considered as a possible error.

The answer to the first hypothesis and the first research question, that there is no significant difference found on an aggregate basis, is in line with the findings of König-Kersting and Trautmann (2016). This, however, limits the possibility of researching the second hypothesis, regarding the influence of altruism on the discrepancy: to reject or support this hypothesis, an observed discrepancy is necessary. The individual heterogeneity showed that there in fact is a discrepancy, but this could not be used in the regressions, since those are based on aggregate data.

Furthermore, the multiple regression method, that is used to analyze the influence of altruism, cannot account for unobservable characteristics. In addition, it is nearly impossible to include all relevant observable variables. Therefore, chances are very high that there was omitted variable bias in play. This can under- or overstate the results.

These limitations are likely to have caused most findings to be insignificant. These findings can neither be interpreted nor extrapolated. Future research would have to take these limitations into account to improve. Future research could also elaborate on varying social distances, to see if individuals act differently between deciding for an anonymous stranger and for someone familiar. If a discrepancy can be found, the influence of the extent of altruism, or other social preferences, can further be researched.

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7. Appendix

Table 6: Summary Statistics Demographic Variables

Variable	Mean	Standard Deviation	Min	Max
Age	29.065	13.814	19	62
Female	0.584	0.496	-	-
Education	4.156	1.288	1	7

Table 7: Categories Education

1	Less than a high school diploma
2	Pre-vocational secondary education (VMBO)
3	Secondary vocational education (MBO)
4	Senior general secondary education (HAVO)
5	Pre-university education (VWO)
6	Higher professional education (HBO)
7	University education (WO)
8	Other

Table 8: Share Ambiguous option chosen in First Decision, Comparison to 0.5 (bitest)

	Mean	Standard Deviation
Self	0.351**	0.480
Other	0.364**	0.484

*, **, *** denotes significance at 10%, 5%,1%.

Table 9: Frequencies PE Self

PE	Frequency	%
0.225	2	2.60
0.325	5	6.49
0.375	1	1.30
0.425	7	9.09
0.475	12	15.58
0.525	27	35.06
0.575	7	9.09
0.625	6	7.79
0.675	5	6.49
0.775	2	2.60
0.825	2	2.60
0.975	1	1.30

Table 10: Frequencies PE Other

PE	Frequency	%
-0.025	1	1.30
0.225	1	1.30
0.275	1	1.30
0.325	4	5.19
0.375	5	6.49
0.425	8	10.39
0.475	8	10.39
0.525	17	22.08
0.575	12	15.58
0.625	6	7.79
0.675	6	7.79
0.725	2	2.60
0.775	1	1.30
0.825	2	2.60
0.975	2	2.60
1.025	1	1.30

Table 11: Variance test PE other - PE self

	Mean	Standard Deviation
PE other	0.537	0.019
PE self	0.528	0.014
P-value (H_A)		
0.024		

Table 12: Proportions Direction AA Index Differences

	Frequency	%	Cumulated %
-1 – 0	29	37.66	37.66
0	25	32.47	70.13
0 – 1	23	29.87	100.00

Table 13: Summary Statistics Altruism

	Mean	Standard Deviation	Median	Min	Max
Altruism	3.49	2.387	4	0	10

Table 14: Frequencies Altruism

Donation	Frequency	%	Cumulated %
0	16	20.78	20.78
1	2	2.60	23.38
2-3	9	11.68	35.06
3-4	7	9.1	44.16
4-5	9	11.68	55.84
5	27	35.06	90.91
5.1-6	2	2.60	93.51
7-8	2	2.60	96.10
8-9	1	1.30	97.40
10	2	2.60	100.00

Survey

Cursive = Added for the clearness of the survey in the Appendix. Was not visible for participants.

Introduction:

The survey will start with three general questions. Then, you will get a short explanation about a little game, followed by one question about it. Lastly, you will receive a short explanation about another game, followed by some questions (the amount of questions depends on your answers). This game will be played twice, in a different context. You will read more about this in the corresponding explanation.

Keep in mind that the monetary amounts used in this survey are HYPOTHETICAL (not real).

Demographic questions:

Q1 How old are you? _____

Q2 What is your gender?

o Male

o Female

o Other

(Note: none of the participants answered other, so gender (female) was generated as a binary variable)

Q3 What is the highest degree or level of school you have completed?

o Less than a high school diploma

o Pre-vocational secondary education (VMBO)

o Secondary vocational education (MBO)

o Senior general secondary education (HAVO)

o Pre-university education (VWO)

o Higher professional education (HBO)

o University education (WO)

o Other

Explanation dictator game:

Imagine you participate in a game together with one stranger. You are the proposer, and the stranger is the receiver. You receive a monetary amount of €10. You can decide yourself how much of this €10 you would like to give to the receiver. The receiver cannot reject your offer; you are entirely free to choose.

Please indicate in the following question what amount of the €10 you would give to the stranger.

Q4 What amount would you give to the receiver?

€0 1 2 3 4 5 6 7 8 9 €10

Explanation questions with urns:

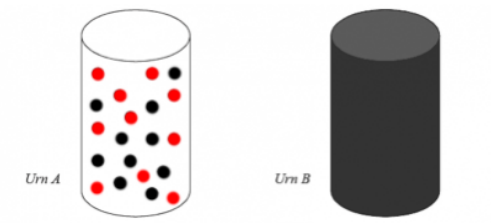
Imagine there are two urns: urn A and urn B. Both urns contain black and red balls.

Urn A is "the risky urn": of this urn, you know the composition of black and red balls. The image below displays an example where "the risky urn" contains 50% black balls and 50% red balls. Urn B is "the ambiguous urn": of this urn, you do NOT know the composition of black and red balls.

The purpose is to draw a red ball. You can choose whether you want to draw a ball from "the risky urn" (known composition) or the "ambiguous urn" (unknown composition).

For every question, the composition of "the risky urn" changes. The new composition will be mentioned in the question. The composition of "the ambiguous urn" - which you do not know - stays the same.

Note: you will not see whether you have drawn a red ball or not. The questions are hypothetical: it is about what you would choose in this situation.



Context:

For the following questions, the situation is such that:

If you draw a black ball, YOU will lose €10.

(OR)

If you draw a black ball, AN ANONYMOUS STRANGER will lose €10.

(Participants see one of these contexts first. Then after the questions, they will get the next context. The order of this is randomized)

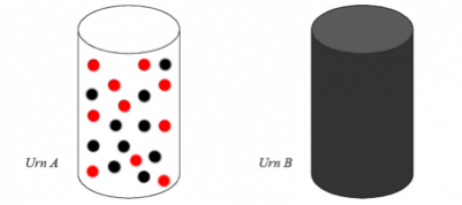
The following information is shown for every question:

Urn A = "the risky urn"

Urn B = "the ambiguous urn"

The purpose is to draw a red ball. YOU (*or)* AN ANONYMOUS STRANGER will lose €10 if you draw a black ball.

Example of a question with urns:



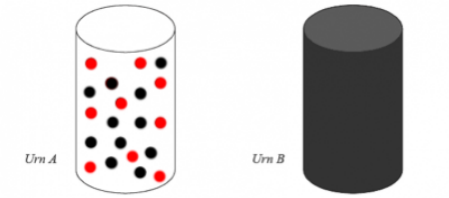
(The image corresponds with the composition mentioned in the question)

Q5 Which urn would you choose if the risky urn contains 50% black balls?

o The risky urn (urn A)

o The ambiguous urn (urn B)

- *If 1 (The risky urn) is answered:*



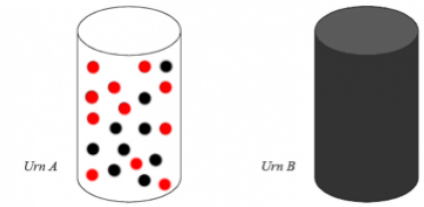
(The image corresponds with the composition mentioned in the question)

Q6 Which urn would you choose if the risky urn contains 55% black balls?

o The risky urn (urn A)

o The ambiguous urn (urn B)

- *If 2 (The ambiguous urn) is answered:*



(The image corresponds with the composition mentioned in the question)

Q6 Which urn would you choose if the risky urn contains 45% black balls?

o The risky urn (urn A)

o The ambiguous urn (urn B)

This continues until the participants switches to the other urn, or, ends when the composition is either 0% or 100% black balls. This bisection method is executed twice (self and other). After that, the survey ends.