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Trust is in the eye of the beholder – How trustors' ambiguity attitudes and trustees' gender and appearance affect trust

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Abstract

This thesis investigates the combined effects of the trustee's gender and ambiguity attitudes of the trustor on trust. Subjects participated in a randomized controlled trial with three treatments, in which they played a trust game with a fictional character. In the control treatment, subjects received no picture of the game partner, while subjects were exposed to a picture of a man or a woman in the other two treatments. The ambiguity attitudes of the participants were measured through a method developed by Baillon et al. (2018) and adapted to trust games by Li et al. (2018). The gender of the trustee did not significantly affect the trustor's ambiguity attitudes and their probability of trusting. Similarly, the two components of ambiguity attitudes, ambiguity aversion, and a-insensitivity, did not significantly influence the trustor's decision to trust.

Keywords: Ambiguity attitudes, Appearance, Gender, Stereotypes, Trust

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"When a man has no reason to trust himself, he trusts in luck."

– Edgar Watson Howe

Introduction

According to neoclassical economic theory, the act of trusting strangers is irrational (Evans and Krueger 2009). Despite its irrationality, McCabe, and Smith (2000) found in their experiment that 50% of participants decided to trust strangers, even though they were aware that the stranger could receive more money by betraying their trust. These findings are not unique to McCabe and Smith's (2000) experiment, as recreations and modified versions resulted in similar percentages of participants trusting (e.g., Cox and Deck 2007, Li et al. 2018). The commonality of the seemingly irrational act of trusting raises the importance of understanding the decision-making process behind such action.

Many studies looked into factors that affect people's decision to trust. Some of these factors are particular to the individual that trusts (the trustor), like ambiguity attitudes (Li et al. 2018) or whether the trustor is a student (e.g., Fehr et al. 2003). Other aspects are specific to the individual that receives the trustor's trust, i.e., the trustee, for instance, the gender of the trustee (e.g., Buchan et al. 2008), or whether the trustee is simulated or a real person (e.g., Bottom et al. 2006). Furthermore, some factors are environmental, like the geographic location of trustors and trustees (Johnson and Mislin 2011), while others are related to the experiment conducted to measure trust, e.g., the anonymity of the subjects and incentive system of the experiment (Johnson and Mislin 2011).

This thesis focuses on two aspects that affect the trustor's decision, ambiguity attitudes and the trustee's gender. Similar experiments were conducted in the past. These studies focus either on ambiguity attitudes (Li et al. 2018) or gender (e.g., Buchan et al. 2008), but not on both topics simultaneously. Li et al.'s (2018) findings show that increased ambiguity aversion reduces the probability of the trustor choosing to trust. Additionally, they found that having higher levels of a-insensitivity (decreased ability to discriminate between different levels of likelihood) diminishes the individual's tendency to act on their own beliefs. Buchan et al. (2008) found that the trustee's gender affects their perceived trustworthiness, with female trustees perceived as more trustworthy than their male counterparts.

Why the trustee's gender affects the trustor's decision has not been answered. Further studies into the mechanism that explains how the disparities between genders occur are essential to fill in this gap. Furthermore, research into the causes of trust disparity is necessary to develop a method that counteracts such disparities induced by gender. This thesis suggests that the impact of trustee's gender on people's willingness to trust is partially explained by different ambiguity attitudes of the trustor towards trustees of different genders**.**

This work argues that gender stereotypes play a role in the trustor's decision-making process. Gender stereotypes create expectations of how individuals should behave (Ellemers 2018) and even how they should look (Green and Ashmore 2006), based on their gender. Deviating from these expectations can punish or praise the stereotype disconfirming individual (Prentice and Carranza 2002). This work proposes that the trustor reacts to the trustee's deviation from physical stereotypes by adjusting their ambiguity attitudes. This adjustment is caused by linking the deviation of physical appearance from physical stereotypes to a potential deviation from behavioral and personality stereotypes connected to trustworthiness. An example of a trait that increases the perceived trustworthiness of an individual is agreeableness (Ben-Ner and Halldorsson 2010), a trait perceived as being more prevalent in women (Costa et al. 2001). Additionally, the trustor's reaction to the deviation from physical stereotypes might be more pronounced if the trustee is a woman since women are judged more by their appearance than males (Fredrickson and Roberts 1997).

To test the hypotheses of this thesis, a randomized controlled trial to collect data about the act of trusting when faced with information about the trustee's gender and appearance while also controlling for ambiguity attitudes was conducted. Subjects were randomly assigned to one of three treatments in which they played a trust game with a fictitious partner. The fictitious partner differs between the three treatments. In the control treatment, no information of the fictitious partner is provided to the subjects. In the male and female treatments, the subjects are exposed to images of men and women representing their fictitious partners for the game. After playing the trust game from the perspective of the trustor, the ambiguity attitudes of the subjects were collected. Finally, the subject played the trust game again, but from the perspective of the trustee.

No significant evidence that the gender of the trustor or the trustee affects the trustor's ambiguity attitudes and the perceived trustworthiness of the trustee was found. Furthermore, no significant effects of ambiguity attitudes on the probability of trusting were found. Thus, the results fail to corroborate Buchan et al.'s (2008) and Li et al.'s (2018) findings.

This thesis is divided into six sections, excluding the abstract, table of contents, and appendix. The first section is the introduction, which provides a brief insight into the researched topic. Secondly, the literature review imparts the reader with information that is crucial for the understanding of this work, ending with the main research question and a theoretical model of how the trustee's appearance and gender impact their trustworthiness. The third section, methodology, consists of explaining how the experiment is structured, the data gathered, and how it was analyzed. After the methodology, the data gathered through the experiment is reported and analyzed in the results section. In the fifth section, discussion, the results are interpreted and contextualized, the main drawbacks and limitations of the experiment are mentioned, and an improved experiment design is suggested for further research. Finally, the thesis concludes with a summary of the findings and final remarks on their relevancy.

Literature review

1. Trust and trustworthiness

Depending on the field of study, different definitions of trust exist. For example, social psychologists define it as the expectation an individual has about the actions of others in a transaction. On the other hand, sociologists and economists relate trust to incentives that incorporate uncertainty in transactions (Grabner-Kraeuter, 2002).

The definition of trust used in this thesis comes from Fehr (2009). He defines trust as an individual's (trustor) behavior of voluntarily placing resources at the disposal of another individual or party (trustee) without any legal commitment and expecting this act to serve in their favor.

Another prominent discussion in the world of academia pertains to what motivates the decision to trust another person. A common view of trust is that it is a purely calculative action, while trustworthiness is based on reciprocity (Ashraf et al., 2006). Philip Pettit (1995) stated four different reasons that lead to trust. The first reason is loyalty, which reflects the trustor's belief in the trustee's loyalty (and their decision to reciprocate because of said loyalty). The second reason is virtue, where the trustor believes that the trustee is a virtuous person, so making that person aware that they were trusted will increase their utility of choosing a "sensible option". Prudence, the third reason, encompasses the trustor's belief that the trustee sees a long-term benefit in doing well by the trustor. The last reason is the trustee's desire for attitude-dependent goods, such as the desire to have a good image and the good opinion of others. While all of Pettit's reasons to trust rely solely on the trustor's view of the trustee, Sapienza et al. (2013) argue that the act of trusting involves two main components, the trustor's perception of the trustworthiness of the trustee, and the trustor's preferences, which include risk preferences, altruism, inequality aversion, and more.

The importance of trust is uncontested. From a societal point of view, trust has been connected to economic growth (Dincer and Uslaner 2009), increased efficiency of the judiciary system, and decreased corruption (Bohnet and Zeckhauser 2004). Because of the positive effects trust has in interpersonal settings, it is crucial to understand the mechanism that leads to trust creation. For instance, the knowledge of why people trust each other can prevent the construction of institutions that corrode and manipulate trust (Philip Pettit 1995).

2. Risk preferences, ambiguity attitudes, and trust

An agent is considered risk-averse if they prefer a specific action over any other action with the same expected outcome but with a greater variance (Stefánsson and Bradley 2019). Consequently, a risk-averse individual prefers a particular prospect (e.g., receive €10 with 100% certainty) over a risky prospect (e.g., receive €20 with a 50% probability and €0 with a 50% probability) with the same expected outcome. Other than risk-averse behavior, there is also risk-neutral behavior, where the individual is indifferent towards a risky and a particular prospect with the same expected outcome, and risk-seeking behavior, which is the opposite of risk aversion.

Many experiments (Eckel and Wilson 2004; Ashraf et al. 2006; Ben-Ner and Halldorsson 2010) have tried to find an effect of risk preferences on the decision to trust, but no significant effects were found. Bohnet and Zeckhauser (2004) argue that a trust-based prospect is similar to a risk-based prospect with additional costs for the trustor. By comparing a risky game with a trust-based game, they show that people are more willing to take risks if the risks are based on chance and not related to another person's trustworthiness. They call this phenomenon betrayal aversion, in which the trust-based prospect incurs betrayal costs, making it less attractive than a chance-reliant risky prospect. Li et al. (2020) show that betrayal aversion is accounted for when the data is controlled for social ambiguity attitudes of the trustor, arguing that trust-based prospects should not be seen as risky prospects with extra costs but rather as ambiguous prospects.

Ellsberg (1961) demonstrated that individuals do not handle risky and ambiguous prospects in the same way with his Ellsberg Paradox. How individuals value ambiguous prospects is dependent on their ambiguity attitudes. According to Abdellaoui et al. (2011), ambiguity attitudes comprise ambiguity aversion and likelihood insensitivity (also called ambiguity-generated likelihood insensitivity or a-insensitivity). Ambiguity aversion is the preference of a clear scenario with known probabilities over a vague scenario with unknown probabilities Fox and Tversky, 1995), while an ambiguity-seeking individual has the opposite preference. Ambiguity-neutral individuals have no preference between the two scenarios. Ambiguity aversion decreases the probability of trusting in trust games (Li et al., 2018).

How an individual assesses and compares two options, one ambiguous and the other unambiguous, is affected by their a-insensitivity, in addition to their ambiguity aversion. A-

insensitivity gauges to what extent a person can discriminate between the different levels of likelihood if probabilities are unknown (Dimmock et al., 2016). Decision-makers tend to see ambiguous prospects as having 50-50 probabilities, so they tend to overweigh the probabilities of unlikely events, while the opposite happens in events with high likelihood. In trust games, higher a-insensitivity increases trust if the trustor believes the trustee is untrustworthy and decreases trust if the trustee is trustworthy (Li et al., 2018).

Trautmann et al. (2008) show that fear of negative evaluation (FNE) is a source of ambiguity aversion, building on top of the competence hypothesis of Fox and Tversky (1995). They explain that people are more comfortable attributing adverse outcomes to bad luck, in the case of risky prospects rather than to a lack of competence, in ambiguous prospects.

Finally, ambiguity attitudes are influenced by partial information. How they are influenced depends on whether the partial information is favorable, unfavorable, or subjective to interpretation towards the goals of the trustor (Peysakhovich and Karmarkar 2016). Thus, partial information may increase or decrease ambiguity attitude levels, affecting the trustor's choice to trust.

3. Gender, stereotypes, and trust

Multiple studies show that women are perceived as more trustworthy. For example, Buchan et al. (2008) detected that gender plays a role in the decision to trust with the help of a trust game. In their case, males showed a higher tendency to trust than females, while females were perceived as more trustworthy. Similarly, Garbarino and Slonim's (2009) findings support the notion that women are less trusting than men and perceived as more trustworthy.

A possible explanation for why women are perceived as more trustworthy relies on the different traits assigned to men and women. Ben-Ner and Halldorsson (2010) state that the personality trait agreeableness is a central component of trustworthiness. Agreeableness is a personality trait reported to be more connected with women (Costa et al. 2001). Therefore, if the trustor perceives a female trustee as agreeable, while no personality trait that increases perceived trustworthiness is attributed to male trustees, women would have higher perceived trustworthiness and consequently a higher probability of being trusted by the trustor.

Ellemers (2018) states that the attribution of certain behavioral and personality traits to a specific gender is deeply rooted in gender stereotypes. These stereotypes lead us to have gender-specific expectations and communicate how society thinks men and women should act (Prentice and Carranza 2002). For example, one stereotypical gender perception is that men, as a group, are more competent, while women are perceived as warmer. Consequently, we expect that men have superior abilities to women, while women's intentions are perceived as more benevolent (Ellemers 2018).

Men's and women's evaluation of women is predominantly based on physical appearance, but men are not judged predominantly by appearance (Fredrickson and Roberts 1997). This double standard could mean that, with the use of stereotypes, we could have stronger estimations and predictions of how women behave based on their appearance than men.

Prentice and Carranza (2002) reported that women are perceived more positively than men concerning social standards, which intuitively aligns with the higher levels of perceived trustworthiness of women. However, the evaluation of women as more positive than men comes at a price since women are held to higher societal standards than men.

Green and Ashmore (2006) showed that certain physical stereotypes are connected to gender roles and shared between American college students. In other words, physical attributes are ascribed to gender roles, and this ascription is somewhat homogenous across the population. This finding may suggest that we connect physical stereotypes to personality traits linked to gender roles, which demonstrate an effect on trustworthiness, like agreeableness (Costa et al. 2001).

The use of stereotypes can be helpful to estimate and predict the behavior of certain groups (Ellemers 2018). However, it leads to overestimating between-group differences and underestimating within-group variation (Ellemers 2018). Individuals who do not conform with stereotypical expectations are devalued and deemed not representative of the group they are a part of instead of updating the stereotypical beliefs on that particular group. Furthermore, traits inconsistent with stereotypes are more conspicuous and, therefore, overweighted when forming estimations about a particular person.

The treatment of stereotype disconfirming individuals varies with the magnitude of the deviation from that stereotype. One reaction is the assimilation to the stereotype, and the

deviation is not noticed. Another treatment is the punishment of deviation through negative evaluation. On the other hand, the individual can, in some cases, be rewarded because of the deviation, receiving a more positive evaluation (Prentice and Carranza 2002).

4. System 1 and trust

Kahneman (2013) divides decision-making behavior into two different modes of thinking. System 1 and System 2 are two forms of thinking engaging with tasks of varying complexity. System 1 is in charge of quick and mindless behaviors and decisions that need little effort. These are automatic actions that rely on intuition, biases, and heuristics (Kahneman 2013). System 2, on the other hand, requires higher levels of concentration and is mentally challenging. This category includes activities that need a high level of focus and cognitive decision-making. System 2 frequently relies on System 1's intuitive nature to reduce effort and mental strain (Kahneman 2013).

Representativeness is one of the heuristics employed by System 1 to make judgments. Decision-makers use the representativeness heuristic to generate subjective probabilities for an event or sample by comparing the conspicuous qualities to a similar and well-known event or parent population (Kahneman and Tversky 1973).

Bordalo et al. (2016) created a model that relies on the representativeness heuristic to explain stereotypes. According to them, people assess target groups by overestimating the frequency of representative traits, characterized as the traits of the target group that are more frequent relative to the overall population. This overestimation of representative traits leads to stereotypes, such as “Asians are good at math”.

Another occurrence elaborating on the decision-making process is the psychological phenomenon that seeks to explain how we reconcile conflicting information, called cognitive dissonance (Festinger 1962). Rabin (1994) argues that dissonance arises when individuals display behavior inconsistent with their own beliefs. Intuitively, an individual’s confidence in their knowledge of a particular subject might be negatively impacted by cognitive dissonance, leading to increased ambiguity aversion through the fear of negative evaluation.

Finally, System 1 plays a significant role in how decision-makers perceive other people’s trustworthiness, as evidenced by the facial recognition experiment performed by Todorov et

al. (2009). The experiment found that people's judgments of another individual's trustworthiness are formed after less than a second of exposure to their faces.

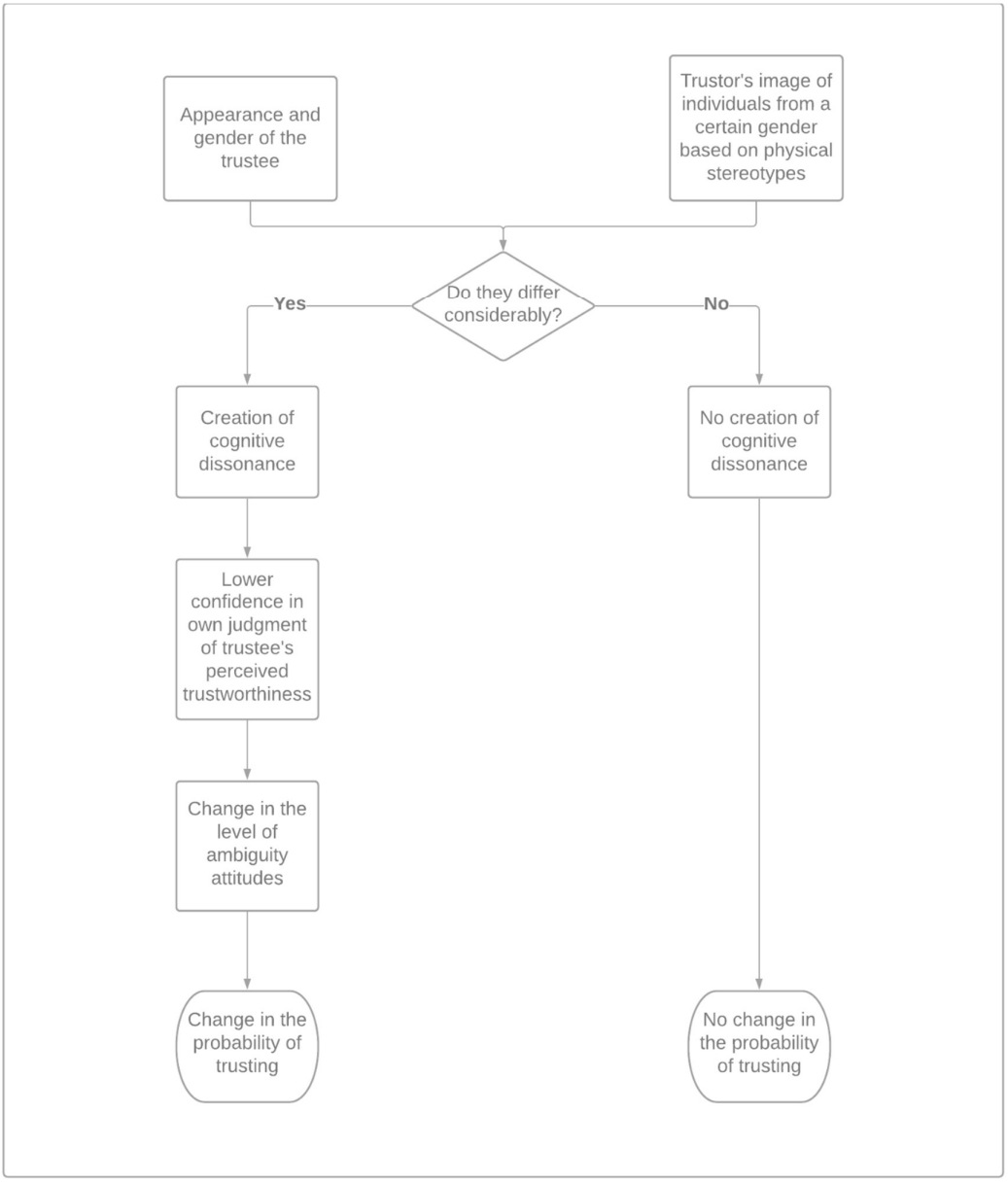
5. A potential trust framework based on gender, appearance, and ambiguity attitudes

Based on the literature gathered in this section, I propose a theoretical model that strives to estimate how the gender and appearance of the trustee affect the decision to trust by interacting with the trustor's ambiguity attitudes. Figure 1 is a visual simplification of the model.

The model assumes that our beliefs about gender are rooted in stereotypes and, consequently, our perception of someone's trustworthiness is anchored on these stereotypes. By exposing the trustor to the appearance of the trustee, the trustor will compare the trustee's appearance to physical stereotypes of the perceived gender of the trustee, using the representativeness heuristic. Suppose the two pieces of information somehow conflict (e.g., the trustee has a more defined jawline than expected based on stereotypes). In that case, this leads to cognitive dissonance and, consequently, the trustee being judged as not representative of the parent population to some extent. This dissonance will possibly make the person less confident of their perceived trustworthiness of the trustee, resulting in a change in ambiguity attitudes due to the fear of negative evaluation. Finally, a change in ambiguity attitudes results in a change in the probability of trusting. Sofer et al.'s (2014) findings – the perceived trustworthiness of a trustee to peak around what is considered the typical face – support the theoretical model.

Additionally, due to the judgment of women being more related to their physical appearance (Fredrickson and Roberts 1997), when compared to men, deviating from stereotypical physical traits on ambiguity attitudes should be more pronounced for women when compared to men. Thus, I anticipate that a trustor is more sensitive to female trustees' deviation from physical stereotypes. Consequently, I expect that the variance of ambiguity attitude levels to be higher for a sample consisting of multiple women (compared to a sample consisting of multiple men) due to the trustor's increased sensitivity to deviations from physical stereotypes by women. So the between trustee variance of ambiguity attitudes in the female treatment would be greater than in the male treatment, leading to an overall greater variance in the female treatment.

Figure 1. Assessment of the perceived trustworthiness of the trustee



6. Research question and hypotheses

The main question driving this work is how gender influences the individual's ambiguity preferences and, ultimately, their decision to trust. In other words, do ambiguity attitudes of the trustor change according to the trustee's gender and appearance?

Three hypotheses were tested with the help of the conducted experiment. Firstly, the previous literature (Buchan et al. 2008; Garbarino and Slonim 2009) shows a tendency of women being perceived as more trustworthy than men, leading to the first hypothesis. The hypothesis is as follows:

The probability of trusting, with trust being a binary choice 0 or 1, of the treatment where the trustee is a woman is higher when compared to the trustee being a man.

$$\text{H1: } P(trust_{woman}) > P(trust_{man}).$$

With the parameters $P(trust_{woman})$, and $P(trust_{man})$ representing:

$P(trust_{woman})$: Probability of the subject trusting when exposed to an image of a woman.

$P(trust_{man})$: Probability of the subject trusting when exposed to an image of a man.

The second hypothesis is that the participants' ambiguity indexes differ between at least two treatments.

$$\text{H2.1: at least one } a_i \neq a_j, \text{ with i and j } \epsilon \{1,2,3\}.$$

$$\text{H2.2: at least one } b_i \neq b_j, \text{ with i and j } \epsilon \{1,2,3\}.$$

With parameters a_1, b_1, a_2, b_2, a_3 and b_3 being:

a_1: A-insensitivity index of participants that were not exposed to an image.

a_2: A-insensitivity index of participants that were exposed to an image of a woman.

a_3: A-insensitivity index of participants that were exposed to an image of a man.

b_1: Ambiguity aversion index of participants that were not exposed to an image.

b_2: Ambiguity aversion index of participants that were exposed to an image of a woman.

b_3: Ambiguity aversion index of participants that were exposed to an image of a man.

Thirdly, considering that women are judged more by their appearance when compared to men (Fredrickson and Roberts 1997), I expect the standard deviation of the ambiguity indexes to be different for the treatment where the trustee is a woman. The difference between treatments stems from a potential higher sensitivity to deviations from physical stereotypes of female trustees. A more general hypothesis is:

$$\text{H3.1: } \sigma_{ai} \neq \sigma_{aj}, with\ i \neq j\ and\ i,j\ \epsilon\ (1, 2, 3)$$

$$\text{H3.2: } \sigma_{bi} \neq \sigma_{bj}, with\ i \neq j\ and\ i,j\ \epsilon\ (1, 2, 3)$$

With the parameters σ_{a1}, σ_{a2}, σ_{a3}, σ_{b1}, σ_{b2}, σ_{b3} being:

σ_{a1}: The standard deviation of the a-insensitivity index of the group that was not exposed to an image.

σ_{a2}: The standard deviation of the a-insensitivity index of the group that was exposed to an image of a woman.

σ_{a3}: The standard deviation of the a-insensitivity index of the group that was exposed to an image of a man.

σ_{b1}: The standard deviation of the ambiguity aversion index of the group that was not exposed to an image.

σ_{b2}: The standard deviation of the ambiguity aversion index of the group that was exposed to an image of a woman.

σ_{b3}: The standard deviation of the ambiguity aversion index of the group that was exposed to an image of a man.

Methodology

In this section, I explain how the I designed the experiment and transformed the gathered data.

1. Design

A randomized controlled trial was conducted, in which the control group resembles the previously conducted experiment by Li et al. (2018). The experiment is constructed in the form of a survey for ease of distribution. The survey was distributed through various online channels as well as personal contacts. There were no monetary incentives to partake in the experiment, and participants did so out of goodwill. The experiment is computer-based and was conducted online due to coronavirus restrictions on social contact.

Participants of the survey were divided into three treatments. All three treatments are divided into five segments. The first segment is an introduction in which the experiment is explained to the participants. The subjects of all three treatments received the introductory text:

"Welcome
Thank you for participating in this study!
This study is part of Leonard Hupfeld's master's thesis. Your participation in this study is voluntary and you may quit at any time. Your data remains confidential and is treated anonymously. Responses you provide will be analyzed in the aggregate only and your individual responses will not be revealed.

In this study you will be part of a trust game with your game partner, which is based on a real person. Please answer the questions like the outcomes would affect you personally and your game partner. The game itself is only fictional and you will not receive the monetary amounts stated in the tasks you complete.

Please read the information provided carefully."

After thanking the subjects for participating in the survey, they are offered the information that they can quit the survey at any point and that their data will be handled anonymously, respecting their privacy. The following paragraph informs the participants that they will play a trust game in the next segment of the survey, finishing with a request to play the game as if the outcomes were tangible and have a real-life impact on them and their game partner.

However, the game is only fictional, and no monetary rewards will be awarded regardless of the outcome.

The second part of the experiment consists of the participants playing a fictitious trust game. Here, the subject plays the role of the trustor, and the trust game follows the same structure as the game found in the paper by Li et al. (2018), with the same monetary values. The base instructions that all three treatments received were as follows:

"In the following segment you will simulate a trust game with another individual.

You can choose between the following two options:

- *Option 1: Follow your partner's instruction for payment*
- *Option 2: Pay €10 to both of you*

If you choose Option 1, your partner will decide the payment for both of you. Your partner can choose between three options:

- *Option A: Pay €15 to both of you;*
- *Option B: Pay you €10, pay your partner €18;*
- *Option C: Pay you €8, pay your partner €22;*

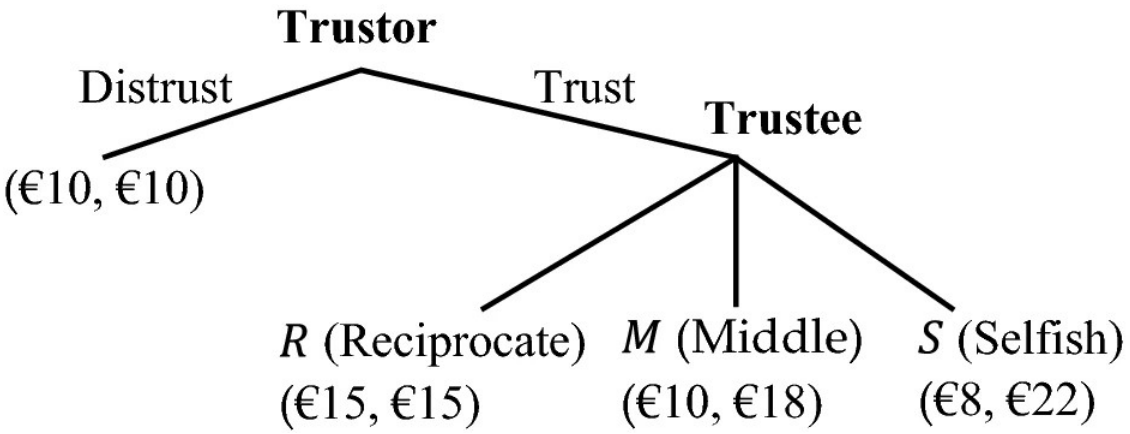
If you choose Option 2, you and your partner will receive €10 each (and your partner's choice will play no role).

Which option do you choose?"

The subject has two options in the trust game. One of the options is to pay out €10 for both the subject and their fictional game partner, making the fictional game partner's choice irrelevant. The subject does not trust their game partner if they choose the first option. The second option is to let the fictional game partner choose one of the three payouts at their disposal, trusting the game partner in the process. If the trustee chooses the first payout – to pay both the trustor and the trustee €15 – it results in a higher payout for both trustor and trustee than the €10 payout of not trusting. Therefore this payout is labeled Reciprocate (R). The second payout that the trustee can choose from is €10 to the trustor and €18 to the trustee. In this payout, the subject receives the payout of not trusting the

trustee (€10), but the trustee receives more. This payout is labeled Middle (M). The final payout option for the trustee is to bestow €8 to the trustor and €22 to the trustee. In this third payout, the amount of money the subject receives is smaller than if they decided not to trust their game partner, but the trustee receives the most out of all the payouts. This payout is labeled Selfish (S). Figure 2 is a visual representation of all the possible payouts in the trust game created by Li et al. (2018).

Figure 2. Payouts of the Trust Game (Li et al. 2018)



Before they play the trust game, the participants are subjected to an image of a person with whom they will play the fictitious trust game in two out of the three treatments. In one of the treatments, the image is of a female, while it is a male in the other treatment. Additionally, there are four images in the pool, two female and two male. Which image the participants received was randomized according to their treatment. One treatment did not receive an image and is regarded as the control. Figures 3 and 4 are the images that the subjects might have seen in their treatments.

The images were selected out of a database curated by the Polytechnic University of Turin in Italy (Vieira et al. 2014) with the explicit permission of the head of the Computer Graphics and Vision Group, Andrea Bottino. The database comprised of images of males and females matched in pairs of two, which were shown to subjects of an experiment in which Vieira et al. (2014) asked whether the image pairs look like siblings or not. I picked two image pairs – one person in the pair is female, and the other is male – that were perceived as siblings by most of the experiment subjects. I assume that pairs that were perceived by more subjects as siblings have more similarities in physical appearance when compared to pairs that were

perceived by fewer subjects as siblings. The two chosen pairs are siblings. The selection of image pairs that are closer in physical appearance diminishes the effect of different physical traits on ambiguity aversion and trust between treatments, which could be misinterpreted as gender effects.

Figure 3. First Sibling Pair, woman on the left and man on the right

Figure 4. Second Sibling Pair, woman on the left and man on the right

Thirdly, after the participants play the role of the trustor, their matching probabilities necessary for the ambiguity measurement method developed by Baillon et al. (2018) are elicited. The method was adapted to the trust game by Li et al. (2018). In the following paragraphs, I explain what matching probabilities are and how they were calculated.

There are three mutually exclusive and exhaustive single events E_i, with $i \in \{r, m, s\}$, which represent the trustee choosing one of three options $I \in \{R, M, S\}$. Additionally, there are three composite events $E_{ij} = E_i \cup E_j$, with j $\in \{r, m, s\}$ and $i \neq j$, representing the trustee choosing option I or J, with $J \in \{R, M, S\}$ and $I \neq J$. For each event E ($E_i or\ E_{ij}$), there is a prospect $X_E 0$, which pays out X (equals €15 in this experiment) if event E is chosen and 0 otherwise.

The matching probability m_i *or* m_{ij} of an event E is the probability for which the subject is indifferent between the potentially ambiguous prospect $X_E 0$ and the risky prospect $X_p 0$, where the subject receives X (€15) with probability p and 0 otherwise. Using the average matching probabilities of the single events $\overline{m_s} = (m_r + m_m + m_s)/3$ and of composite events $\overline{m_c} = (m_{rm} + m_{rs} + m_{ms})/3$, the ambiguity aversion index *b* and the a-insensitivity index *a* are calculated as follows:

$b = 1 - \overline{m_s} - \overline{m_c}$, and

$a = 3 \times (\frac{1}{3} - (\overline{m_c} - \overline{m_s}))$.

With $\overline{m_s} = \frac{1}{3}$ and $\overline{m_c} = \frac{2}{3}$, the subject is ambiguity neutral since both indexes are 0. An ambiguity-averse individual has lower matching probabilities, and consequently, a higher ambiguity aversion index. On the other hand, an ambiguity-seeking individual has higher matching probabilities and a lower ambiguity aversion index value. The highest value that the ambiguity aversion index can take on is 1, and the lowest is -1 since the index is normalized to have a maximum value of 1 and a minimum level of -1.

The a-insensitivity index can take on values from -2 to 1. A person who does not distinguish between single and composite events has an a-insensitivity index of 1 and attributes fifty-fifty probabilities to uncertain events. A lower value attributed to the a-insensitivity index means that the person discriminates more between single and composite events.

The matching probabilities were elicited through six choice lists that make the participant choose one of two options, as seen in figure 5. One of the options was to receive a fixed monetary reward x dependent on the choice made by the trustee in the trust game. The second option was to receive the same monetary amount x with probability p. The probability p of option two incrementally increases in the list, while option one remains the same. The method to elicit the matching probabilities of the participants is different from the method used by Li et al. (2018) due to the difficulty of adapting it to the survey format. The choice lists were accompanied by a text specifying the decision they have to make in the choice list. An example of the text can be found below:

"*Please state your preference between the two payouts.*

The payouts are:

- *€15 with a given probability;*
- *€15 if your partner chooses Option A, instead of Options B and C;*

Remember, the options your partner can choose are as follows:

- *Option A: Pay €15 to both of you;*
- *Option B: Pay you €10, pay your partner €18;*
- *Option C: Pay you €8, pay your partner €22."*

The text changes slightly between choice lists, as this is an example for eliciting the matching probabilities of the trustee choosing Option A instead of Options B and C. The texts for the remaining choice lists can be found in Appendix A.

Figure 5. Example of a choice list used to elicit the matching probabilities

	Please state your preference	
	€15 with the given probability	€15 if your partner chooses option A
Probability is 10%	○	○
Probability is 20%	○	○
Probability is 30%	○	○
Probability is 40%	○	○
Probability is 50%	○	○
Probability is 60%	○	○
Probability is 70%	○	○
Probability is 80%	○	○
Probability is 90%	○	○

To calculate the matching probability of a subject, it is necessary to look at the point where the subject changes from one option to the other (one column to the other). For example, imagine a subject switched from column two, the ambiguous prospect, to column one, the risky prospect, at the 50% probability point. The matching probability of this subject is the probability of the last line where the ambiguous prospect was chosen, plus the first line where the risky prospect was chosen, divided by two, so in this case (40%+50%)/2=45%. The matching probability is the point of indifference between the risky and ambiguous prospects, so the indifference point has been reached when a subject switches between

columns. It is impossible to derive the precise matching probability since the indifference point between prospects could be any probability between the subject's last choice for the ambiguous prospect and the first choice for the risky prospect. Therefore, the middle point of the column switch is chosen as the indifference point – and consequently as the matching probability – to minimize the maximum deviation of the calculated matching probability to the actual matching probability of the subject. In this way, the calculated matching probability can deviate at most 5% from the actual matching probability.

Since the probability for the risky prospect starts at 10% and incrementally increases by 10% until it reaches 90% (as seen in figure 5), subjects should change between columns a maximum of one time, and only change from column two (ambiguous prospect) to column one (risky prospect), not the other way around. The subject should rationally only switch from column two to column one, because the probability of receiving €15 in the risky prospect increases incrementally in 10% steps, while the probability assigned to receiving €15 in the ambiguous prospect by the subject (also called subjective probability) remains constant throughout the entire choice list. There are two cases where the subject does not need to switch their choice from the second column to the first column. In the first case, the subject chooses only column one, which happens when the matching probability between the two prospects is less than or equal to 10%. In this case, the matching probability is calculated as follows: (0%+10%)/2=5%. In the second case, the subject perceives the ambiguous chance of receiving €15 to be more than or equal to 90%. Thus the subject chooses column 2, and the matching probability is calculated as (90%+100%)/2=95%. All answers in which the subject switches between columns more than once are disregarded due to the monotonicity assumption.

Li et al. (2018) did not use choice lists in their experiment to elicit the matching probabilities. However, this work uses choice lists because of their ease of implementation into an online survey.

Before the subjects answered the choice lists, they were explained how they work. The explanatory text can be found in Appendix A. To check whether the subjects understood the explanation, they were presented with three questions about how the choice list works. The three questions were randomized out of a pool of seven questions. One question about the risky prospect was always the same:

"If you choose to get €15 with the given probability and the stated probability is 30%, how much money would you get?"

This question aims at checking whether the subject understands the concept of a risky prospect. The second and third questions were about the ambiguous prospect. In the second question, the subjects were given one of three questions, asking about the understanding of the consequences of choosing the ambiguous prospect in the choice list and their belief on the probability of the trustee choosing one specific payout of the three payouts offered to them. An example of the second question can be found below:

"If you choose to get €15 if your partner chooses Option A, instead of Options B and C, how much money would you get?

Remember, the options your partner can choose are as follows:

- *Option A: Pay €15 to both of you;*
- *Option B: Pay you €10, pay your partner €18;*
- *Option C: Pay you €8, pay you partner €22"*

The third question is similar to the second question. The difference is that the subjects understanding of the probability of two specific payouts being chosen by the trustee instead of only one of the three payouts is checked. For example, one of the questions in the third question pool was the following:

"If you choose to get €15 if your partner chooses Option A or Option B, instead of Option C, how much money would you get?

Remember, the options your partner can choose are as follows:

- *Option A: Pay €15 to both of you;*
- *Option B: Pay you €10, pay your partner €18;*
- *Option C: Pay you €8, pay you partner €22"*

The complete list of questions about understanding can be found in Appendix A.

In the fourth segment, the participant replays the trust game. This time, the participant receives the role of trustee. The participants received the following instructions:

"Now you play the trust game again, but from the opposite perspective.

Your game partner has two options:

- *Option 1: Follow your instruction for payment*
- *Option 2: Pay €10 to both of you*

If your partner chooses Option 1, to follow your instruction for payment, then you can choose between three different Options:

- *Option A: Pay €15 to both of you;*
- *Option B: Pay your partner €10, pay you €18;*
- *Option C: Pay your partner €8, pay you €22"*

All the payouts and options mirror the first trust game. However, now the participant can choose Reciprocate, Middle, or Selfish, instead of trusting or distrusting the game partner.

Finally, the participants were presented with demographic questions and general questions about their trust and trustworthiness beliefs. There are eight questions in this segment, with the first three being World Values Survey's (WVS) and General Social Survey's (GSS) questions on general trust. The three questions are:

1. *"Generally speaking, would you say that most people can be trusted or that you cannot be too careful in dealing with people?"*
2. *"Would you say that most of the time, people try to be helpful, or that they are mostly just looking out for themselves?"*
3. *"Do you think that most people would try to take advantage of you if they got the chance or would they try to be fair?"*

The answer to all three questions is designed as a slider that ranges from '0' to '100', giving the participants a wide range of possible answers.

The last five questions are about demographics. The questions asked are *'what is your age?', 'what is your gender?', 'In which country do you currently reside?', 'What is your*

country of origin?', and *'What is the highest level of school you have completed or the highest degree you have received?'.*

2. Variables

The variables used in the data analysis were all collected from the survey. Most of the variables, except three, were used without any further transformation from the gathered data. The other three variables, the a-insensitivity index, the ambiguity aversion index, and the general trust variable, need to be derived from the gathered data.

Ten variables comprise the data analysis (see table 1). The first variable is the variable of interest, the decision made by the participants when they play a trust game from the perspective of a trustor. This variable is binary, with the options 'trust' and 'not trust'.

Treatment is categorical and represents the three treatments of the survey, control, woman, and man. This categorical variable is the main difference between this work and Li et al. (2018). The third and fourth variables are continuous, the ambiguity aversion index and the a-insensitivity index. These indexes together comprise ambiguity attitudes. These three variables are the variables of interest of the experiment.

'Trustee' is a categorical variable and represents the subject playing the trust game from the trustee's perspective. The variable can take on three values, which represent the three options the trustee can choose. The options are 'Pay €15 to both of you', 'Pay your partner €10, pay you €18', and 'Pay your partner €8, pay you €22'.

The sixth variable, general trust, is continuous and can take on values from '0' to '100'. This variable takes on the mean of the scores given to the three general trust statements 'Generally speaking, would you say that most people can be trusted or that you cannot be too careful in dealing with people?', 'Would you say that most of the time, people try to be helpful, or that they are mostly just looking out for themselves?', and 'Do you think that most people would try to take advantage of you if they got the chance or would they try to be fair?'. A low score means that the subject is distrustful in general, while a higher score means that the subject is more trustful in general.

Table 1. Information about variables used in the statistical analysis

Variables	Meaning
trustor	Binary variable that takes on the value of 0 if the subject decided not to trust and 1 if they decided to trust.
treatment	Categorical variable which can take on the values 1, 2, and 3. The value 1 represents the control group, the value 2 represents the female treatment, and the value 3 represents the male treatment.
trustee	Categorical variable which can take on values 1,2, and 3. The value 1 represents choosing the 'Reciprocate' option when the subject takes on the role of trustee, the value 2 represents choosing the 'Middle' option, and 3 represents choosing the 'Selfish' option.
ambiguity aversion	This continuous variable takes on the value of the ambiguity aversion index of the subject. It can take on values from -1 to 1.
a-insensitivity	This continuous variable takes on the value of the a-insensitivity index of the subject. It can take on values from -1 to 2.
age	This continuous numeric variable takes on the age of the subject. It can take on values from zero and up.
general trust	This continuous numeric variable takes on the average of the three questions on general trust by the WVS and GSS of the subject. It can take on values of 0 to 100.
residence	This binary variable takes on the value of 0 if the subject resides in the Netherlands and 1 otherwise.
gender	This categorical variable takes on the value of 1 if the subject is male, 2 if the subject is female, 3 if the subject identifies with a third gender or as non-binary.
education	Categorical variable that can take on the values 1 to 8. The values 1 to 8 represent the subjects' educational levels 'Less than high school degree', 'High school graduate', 'Some college but no degree', 'Associate degree in college (2-year)', 'Bachelor's degree in college (3/4-year)', 'Master's degree', 'Doctoral degree', and 'Professional degree (JD, MD)', respectively.

The seventh variable is continuous and represents the participant's age. The variable gender has a total of four categories. The four categories of the gender variable are male, female, Non-binary / third gender, and *prefer not to say. Due to a low number of participants*

choosing the categories Non-binary / third gender, and 'prefer not to say', the variable will be treated as a binary variable with male and female values.

Residence is a binary variable that clusters the subjects into two groups: people residing in the Netherlands and people outside the Netherlands. To create this variable, I asked for the participant's place of residence, creating a categorical variable comprised of countries. Afterward, the subjects were clustered into the two groups of the variable residence.

Education is the final variable, and each category represents a different level of education that the subject can choose.

Results

1. Descriptive statistics

The survey was distributed between the 16th of June 2021 and the 27th of July 2021. Of the total of 208 people that started the online survey, 109 did not complete the survey. Sixty-six of the 101 passed the monotonicity check. How the monotonicity check was implemented can be found in Appendix B.

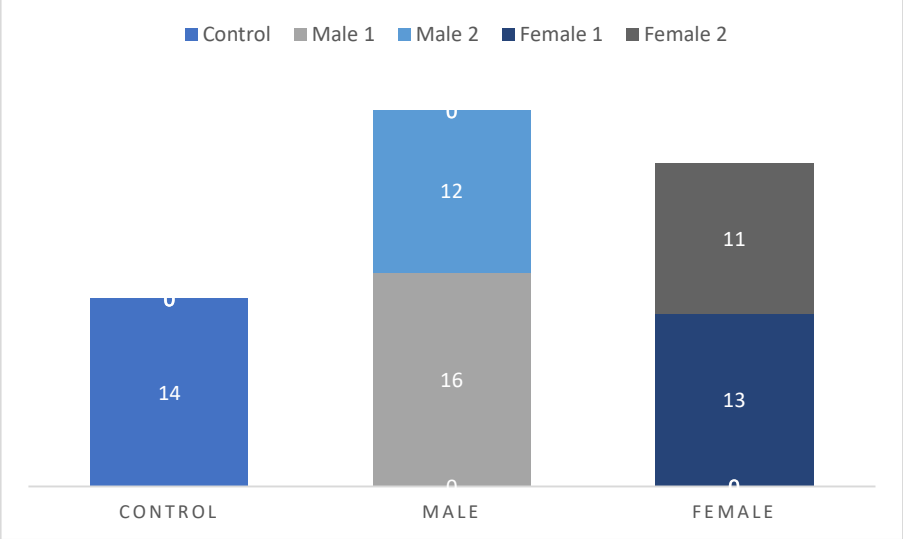
Table 2. Descriptive statistics

Variables	Obs.	Mean	Freq.	SD	Min	Max
Gender:	66					
Male	34	-	51.52%	-	-	-
Female	27	-	40.91%	-	-	-
Non-binary/third gender	2	-	3.03%	-	-	-
Prefer not to say	3	-	4.55%	-	-	-
Education Level:	66					
Less than high school degree	1	-	1.52%	-	-	-
High school graduate	1	-	1.52%	-	-	-
Some college but no degree	3	-	4.55%	-	-	-
Bachelor's degree in college	43	-	65.15%	-	-	-
Master's degree	16	-	24.24%	-	-	-
Doctoral degree	1	-	1.52%	-	-	-
Professional degree (JD, MD)	1	-	1.52%	-	-	-
Treatment:	66					
control	14	-	21.21%	-	-	-
male	28	-	42.42%	-	-	-
female	24	-	36.36%	-	-	-
Trustee:	66					
Reciprocate	45	-	68.18%	-	-	-
Middle	13	-	19.70%	-	-	-
Selfish	8	-	12.12%	-	-	-
Age	66	25.97	-	8.31	16	65
Trust	66	-	50.00%	-	-	-
Dutch residency	66	-	53.03%	-	-	-
Ambiguity aversion index	66	-0.0116	-	0.3856	-0.9	0.9
A-insensitivity index	66	0.647	-	0.4031	-0.1	1.9
General Trust	66	51.85	-	20.48	5.33	96.67

The collected data is divided into ten variables (see table 2). From these ten variables, four are categorical with more than two outcomes. These four variables are gender, education level, treatment, and trustee. From the gender variable, we can gather with which gender the subject identifies. Thirty-four subjects identified as male, while 27 were female, an equivalent of 51.52% and 40.91% of the sample, respectively. Two subjects identified as non-binary/third gender, and three preferred not to disclose their gender, accounting for 7.58% of the sample. While doing the statistical analysis, the gender variable will be treated as binary because only five subjects did not identify as either male or female.

The second categorical variable with more than two outcomes is the education level. The most common education level of the sample was the bachelor's degree, with 43 responses, an equivalent of 65.15% of the sample. Sixteen subjects had finished a master's degree, accounting for 24.24% of the sample. The only other education level chosen by more than one subject is 'some college but no degree', with three observations (4.55% of the sample). 'Less than high school degree', 'High school graduate', 'Doctoral degree', and 'Professional degree (JD, MD)' all accounted for one observation each, and a combined total of 6.06% of the sample. Since only two education levels had more than ten responses, it was not used as a dependent variable in the statistical tests and regressions performed.

Figure 6. Composition of treatments

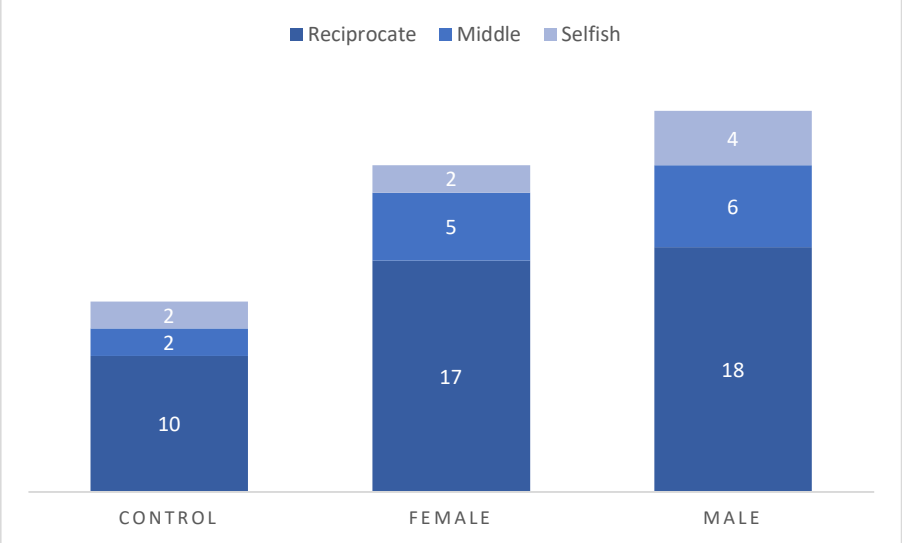


The third categorical variable of the survey is treatment. Fourteen subjects were assigned to the control group (21.21% of the sample), while 28 (42.42% of the sample) and 24 (36.36%

of the sample) were assigned to the male and female treatments, respectively. Furthermore, the male and female treatments can still be divided into two, as seen in figure 6. Sixteen subjects (57.14% of the male treatment sample) were exposed to the male picture of figure 1, while 12 subjects (42.86% of the male treatment sample) received the male picture of figure 2. Thirteen subjects (54.17% of the female treatment sample) were exposed to the picture of the woman from figure 1, and the 11 remaining subjects (45.83% of the female treatment sample) of the female treatment received the picture of the woman from figure 2.

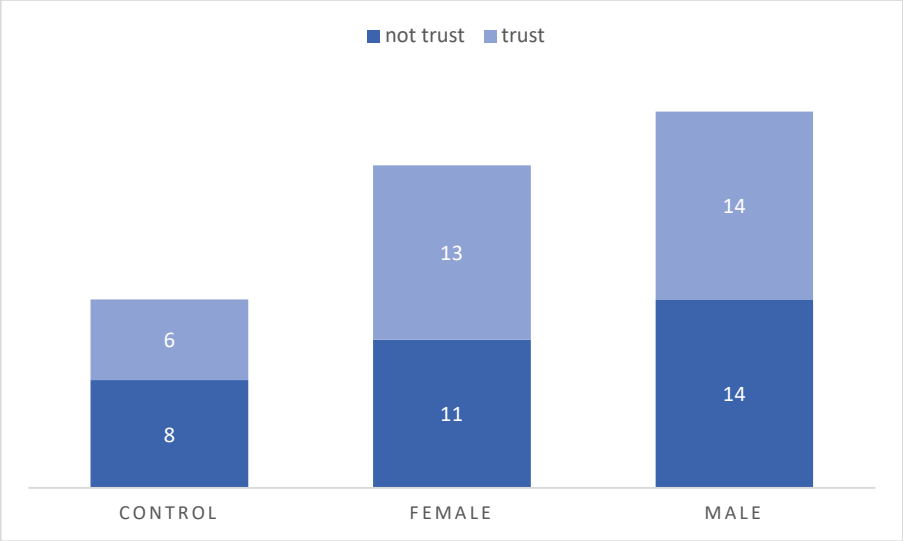
The last categorical variable that is not binary, trustee, represents the choice made by the subject from the trustee's perspective. The option most chosen by the participants was 'reciprocate', accounting for 45, or 68.18%, of the responses. Thirteen subjects picked the option 'middle', which is equivalent to 19.70% of the sample. 'Selfish', with eight responses, was chosen by 12.12% of the total sample. When separating the trustee choices by the treatments (see figure 7), 14.29% of the control group picked the selfish option, while 14.29% and 71.43% chose options middle and reciprocate, respectively. In the case of the female treatment, subjects chose the selfish, middle, and reciprocate choices a total of 8.33%, 20.83%, and 70.83% of the time, respectively. The percentages per trustee choice for the male treatment are 14.29% for selfish, 21.43% for middle, and 64.29% for reciprocate.

Figure 7. Trustee choices by treatment



Two out of the ten variables are binary, which are 'trust' and 'Dutch residency'. 'Trust' represents the option to trust or distrust that the subjects had, from the perspective of the trustor. The same amount of respondents decided to trust and not to trust, with 33 (50% of the sample) deciding to trust and 33 choosing not to trust the trustee. In the control treatment, 42.86% of the subjects decided to trust, while the percentage of subjects that decided to trust amounted to 54.17% and 50.00% of the female and male treatments, respectively (see figure 8).

Figure 8. Trustor choices by treatment



The variable 'Dutch residency' splits the subjects' place of residence into two, living in the Netherlands and outside the Netherlands. Thirty-five respondents (53.03% of the total sample) live in the Netherlands, while 31 (46.97%) live outside the Netherlands.

The last four variables gathered, 'age', 'ambiguity aversion index', 'a-insensitivity index', and 'general trust beliefs', are all continuous. The age variable represents the subject's age in years. The mean age of the subjects was 25.97 years, with a standard deviation of 8.31 years. The youngest subject was 16 years old, and the oldest subject was 65 years old.

The 'ambiguity aversion index' is a numerical representation of the subject's ambiguity aversion, calculated based on the subject's responses to the choice lists of the survey. The mean ambiguity aversion index of the sample was -0.0116, with a standard deviation of 0.3856. The minimum ambiguity index value in the sample was -0.9, while the highest was 0.9.

Similar to the ambiguity aversion index, the a-insensitivity index was also based on the choice lists of the survey and measures how the subjects discriminate between single and composite events. The mean a-insensitivity of the sample is 0.6470, with a standard deviation of 0.4031. The minimum value attributed to the a-insensitivity index was -0.1, while the highest value was 1.9 in this sample.

The last continuous variable gathered from the survey is general trust, representing the mean of each subject's answer to the three questions about general trust from the WVS and GSS. The mean value of the variable was 51.85, with a standard deviation of 20.48. The lowest value assigned to the variable by the respondents was 5.33, while the highest value was 96.67.

2. Correlation and Multicollinearity tests

Before running any statistical tests or creating models, it is necessary to test whether the independent variables do not suffer from multicollinearity or correlation issues. Therefore, the variance inflation factor (VIF) and Spearman's correlation coefficients for the variables were calculated to check for any multicollinearity and correlation problems, respectively. As a rule of thumb, if the VIF has a value under ten, the data sample does not suffer from serious multicollinearity issues (O'brien 2007). Additionally, the statistical significance of the Spearman coefficient was measured for correlation issues.

Table 3. Test for multicollinearity

variable	VIF
treatment	1.18
ambiguity aversion	1.09
a-insensitivity	1.14
age	1.41
general trust	1.21
residence	1.28
gender	1.17

As seen in table 3, the VIF of the independent variables is lower than 2 for all of the variables. The highest VIF is attributed to the variable age, 1.41, and the lowest VIF value belongs to ambiguity aversion.

Table 4. Spearman's test for correlation

variables	trustor	treatment	ambiguity aversion	a-insensitivity
trustor	1.0000			
treatment	0.0325	1.0000		
ambiguity aversion	-0.1957	0.0827	1.0000	
a-insensitivity	0.0584	-0.0223	0.1712	1.0000

*** p<0.01, ** p<0.05, * p<01

The Spearman's correlation factor between the dependent variable trustor and the variables of interest treatment, ambiguity aversion, and a-insensitivity display the values of 0.0325, -0.1957, and 0.0584, respectively (see table 4). None of the correlations between the dependent and independent variables is statistically significant at a 10% level. Additionally, the correlation values between the three variables of interest are insignificant at a 10% level.

Since the variables are not collinear and are not significantly correlated, the tests present no issue for the logistic and OLS regressions.

3. Logistic regression (logit) models

Below, the main results of the logistic regressions are reported. The models created can be found in table 5. The logit models were created to answer hypothesis 1, that the probability of trusting a woman is higher than the probability of trusting a man.

The respective formulas of the first and second logit models are:

1. $P(trust = 1|treatment, a, b) = \frac{\exp(\beta_0+\beta_1*treatment+\beta_2*a+\beta_3*b)}{1+\exp(\beta_0+\beta_1*treatment+\beta_2*a+\beta_3*b)}$
2. $P(trust = 1|treatment, a, b, X_i) = \frac{\exp(\beta_0+\beta_1*treatment \quad \beta_2*a+\beta_3*b+\beta_i*X_i)}{1+\exp(\beta_0+\beta_1*treatment+\beta_2*a+\beta_3*b+\beta_i*X_i)}$

trust: 0 if the trustor did not trust, 1 if the trustor did trust.

treatment: 1 if subject is part of the control group, 2 if subject is part of the female treatment, and 2 if the subject is part of the male treatment.

a: value of the a-insensitivity index.

b: value of the ambiguity aversion index.

X_i: *The demographic control variables and the general trust variable.*

The first model created, model 1, measures the effects of the three main variables of interest, treatment, ambiguity aversion, and a-insensitivity on the dependent variable trustor. The control and male treatments have a negative effect on trust (an increase in the ambiguity aversion index decreases the probability of the subject trusting the trustee) compared to being in the female treatment, ceteris paribus. The variable ambiguity aversion has a negative coefficient and, consequently, a negative effect on trust, ceteris paribus. The last variable, a-insensitivity, has a positive coefficient, and an increase in a-insensitivity increases the probability of the subject choosing to trust, all things being equal. Since all p-values are above 0.1, none of the effects are significant at a 10% significance level.

Table 5. Logistic regression models

trustor	Model 1	Model 2
treatment		
control	-0.488	-0.253
	(0.69)	(0.88)
male	-0.145	-0.323
	(0.57)	(0.67)
ambiguity aversion	-1.190	-1.508
	(0.73)	(0.99)
a-insensitivity	0.492	0.740
	(0.65)	(0.85)
age		-0.025
		(0.05)
general trust		0.051***
		(0.02)
residence		0.628
		(0.66)
gender		-0.358
		(0.65)
constant	-0.164	-2.428
	(0.58)	(1.82)

*Standard errors in parentheses. *** p<0.01, ** p<0.05, * p<01*

The second model is similar to the first model, except for the addition of demographic controls and the variable general trust. All three variables of interest, and the demographic control variables age, residence, and gender, have p-values over 0.1, and their effects are

not significant at a 10% significance level. The subjects' general trust beliefs positively affect trusting, which means that an increase in the mean score of the three questions about general trust increases the probability of the subject trusting the trustee, ceteris paribus. Furthermore, general trust's effect on trustor has a p-value of 0.007, making it significant at a 1% significance level.

The p-values of the effects the treatment variable has on trust are above 0.1, and therefore, the effects are not significant at a 10% significance level in both models. Consequently, we cannot reject the null hypothesis of H1, that the gender of the trustee has no direct effect on the probability of the subject deciding to trust.

A version of both logit models with the base category of the treatment variable being male can be found in Appendix C.

4. Ordinary least squares (OLS) regressions for the ambiguity indexes

The OLS regressions were conducted to measure whether the trustee's gender affects the two indexes that jointly form an individual's ambiguity attitudes, the ambiguity aversion index and the a-insensitivity index, testing whether hypothesis 2 is correct.

The formulas for the four OLS models are the following:

1. $a = \beta_0 + \beta_1 * treatment + \beta_2 * b + \varepsilon$
2. $a = \beta_0 + \beta_1 * treatment + \beta_2 * b + \beta_i * X_i + \varepsilon$
3. $b = \beta_0 + \beta_1 * treatment + \beta_2 * a + \varepsilon$
4. $b = \beta_0 + \beta_1 * treatment + \beta_2 * a + \beta_i * X_i + \varepsilon$

Where ε is the error term.

Model 3 (see table 6) is an OLS regression with the dependent variable ambiguity aversion and the independent variable treatment. The ambiguity aversion index increases by 0.009 when the subject is part of the control treatment compared to the female treatment. Similarly, the ambiguity aversion index increases by 0.0401 if the subject is part of the male treatment compared to the female treatment. Both effects are not significant at the 10% significance level.

The fourth model (see table 6) adds the variables age, general trust, residence, and gender as controls for model 3. After controlling for demographics and general trust, the effects of

the control and male treatments on the ambiguity aversion index are negative. The negative values mean that being part of the control (male) treatment makes the subjects less ambiguity averse when compared to the female treatment, ceteris paribus. These effects have p-values over 0.1 and are consequently not significant at a 10% significance level. The variables age, general trust, residence, and gender also have p-values over 0.1, and thus their effects are not significant at a 10% significance level.

Table 6. Robust ordinary least squares regression for the ambiguity aversion index

ambiguity aversion	Model 3	Model 4
treatment		
control	0.009	-0.019
	(0.12)	(0.13)
male	0.040	-0.070
	(0.11)	(0.11)
age		0.009
		(0.01)
general trust		0.000
		(0.00)
residence		-0.083
		(0.10)
gender		0.043
		(0.10)
constant	-0.031	-0.215
	(0.08)	(0.30)

*Standard errors in parentheses. *** p<0.01, ** p<0.05, * p<01*

Since both models, 3 and 4, do not display significant effects of the treatment on the ambiguity aversion index, we cannot reject the null hypothesis of H2.1 that the ambiguity aversion index of the trustor does not change according to the trustee's gender.

The fifth and sixth models attempt to measure the effects of the variable of interest, treatment, on the a-insensitivity index. Model 5 (see table 7) shows that the subjects' a-insensitivity index increases if they are part of the control and male treatments compared to being in the female treatment, ceteris paribus. Consequently, subjects discriminate less between single and composite events if they are part of the control and male treatments when compared to the female treatment. With p-values over 0.1, the effects of the control and male treatments, when compared to the female treatment, on the a-insensitivity index are not significant at a 10% significance level.

Table 7. Robust ordinary least squares regressions for the a-insensitivity index

a-insensitivity	Model 5	Model 6
treatment		
control	0.039	0.144
	(0.11)	(0.12)
male	0.032	-0.022
	(0.12)	(0.11)
age		0.009
		(0.01)
general trust		0.004
		(0.00)
residence		-0.067
		(0.11)
gender		0.158
		(0.11)
constant	0.625***	0.164
	(0.07)	(0.38)

*Standard errors in parentheses. *** p<0.01, ** p<0.05, * p<01*

Model 6 (see table 7) adds the control variables age, general trust, residence, and gender to model 5. Compared to model 5, the sign of the coefficient of the male treatment changed to negative. Being part of the control and male treatments does not significantly affect the a-insensitivity index on a 10% significance level compared to being part of the female treatment. Similarly, the effects of the demographic variables age, residence, and gender, as well as the general trust beliefs, on a-insensitivity have p-values over 0.1. Thus, they are not significant at a 10% significance level. Since being part of different treatments does not significantly change the a-insensitivity index, we cannot reject the null hypothesis of H2.2, that the trustee's gender does not affect the a-insensitivity index of the trustor.

A different version of all four OLS models, with the base category of the treatment variable being male, can be found in appendix C.

5. Variance comparison tests

The test for the third hypothesis checks whether the variance of the two ambiguity attitude indexes of the subjects have different variances depending on their treatment.

Running a Levene's test for equality of variance to check whether the standard deviation of the ambiguity aversion index differs between groups (see table 8) displays the three means of the treatments and their variance. The difference between the variances has a p-value

over 0.1 and is consequently not significant at a 10% significance level. Therefore, we cannot reject the null hypothesis of H3.1, that the gender of the trustee does not affect the variance of the ambiguity aversion index.

Table 8. Levene's test for equality of variances for ambiguity aversion index

treatment	mean	frequency
control	-0.0214	14
	(0.3401)	
female	-0.0306	24
	(0.3818)	
male	0.0095	28
	(0.4210)	
total	-0.0116	66
	(0.3856)	

*Standard errors in parentheses. *** p<0.01, ** p<0.05, * p<01*

Applying Levene's test for equality of variance to the a-insensitivity index (see table 9) delivers a p-value over 0.1. The difference in variances is, therefore, not significant at a 10% significance level. Thus, similarly to H3.1, we cannot reject the null hypothesis of H3.2, which states that the trustee's gender does not affect the variance of the a-insensitivity index.

Table 9. Levene's test for equality of variances for a-insensitivity index

treatment	mean	frequency
control	0.6643	14
	(0.3249)	
female	0.6250	24
	(0.3492)	
male	0.6571	28
	(0.4857)	
total	0.6470	66
	(0.4031)	

*Standard errors in parentheses. *** p<0.01, ** p<0.05, * p<01*

There is no significant evidence that supports any of the three main hypotheses.

Discussion

In the discussion section, I compare the main findings with previous literature and discuss possible reasons why they differ. Next, I delve into the main limitations of the experiment and the totality of this work. The last subsection proposes an improved version of the experiment for future research while considering the experiment's limitations.

1. General Discussion

When comparing the number of subjects that chose to trust in the experiment (50%) to Li et al. (2018), with 54% of subjects deciding to trust, the results seem to match. Another similarity to their findings is that the answers to the general trust belief questions are positively correlated to the decision to trust by the trustor.

The findings also have discrepancies as compared with the work by Li et al. (2018). One such discrepancy is the lack of significant effects of the participants' ambiguity attitudes on the probability of trusting. The other discrepancy is present in the participants' choices as the trustee. In the findings, 68.18% of participants chose to reciprocate, 12.12% chose the selfish option, and 19.70% picked the middle choice. On the other hand, Li et al. (2018) had findings that do not align with these values, with the majority (52%) choosing the selfish option, while 21% and 27% chose the options reciprocate and middle, respectively. Thus, most of my subjects reciprocated trust by sharing the benefits, while Li et al.'s sample did not benefit from trusting. The two main discrepancies can be explained through the limitations of the survey, mainly the lack of monetary incentives and possible self-selection bias. The lack of monetary incentives might incentivize the participants not to show their true beliefs and intentions. At the same time, self-selection bias might have skewed the sample toward more prosocial and reciprocating behavior from the subjects.

The experiment results do not show any significant effects of the trustee's gender on the decision to trust, thus failing to corroborate the findings by Buchan et al. (2008), which state that women are perceived as more trustworthy than men. Furthermore, no significant effect of the trustor's gender on the decision to trust was found, another deviation from Buchan et al.'s (2008) work, where they found that men trust more than women.

The three hypotheses – the trustee's gender affects the trustor's decision to trust, the trustee's gender affects the trustor's probability of trusting, the trustor's ambiguity

attitudes, and the variance of the decision to trust – were not proven correct. Consequently, the theoretical model was not substantiated.

2. Limitations

The discrepancies between this work and Li et al. (2018) and Buchan et al. (2008) can be partially explained by the main limitations of the experiment.

The first limitation is the lack of real monetary rewards in the experiment. Without extrinsic rewards, people rely on intrinsic motivators to participate in the survey. Kuilen and Wakker (2006) expressed that proper incentives are necessary to avoid irrational decision-making due to misunderstandings and lack of motivation. The lack of monetary incentives also gives Pettit's (1995) fourth reason for trusting, the trustee's desire for attitude-dependent goods, more weight, since reciprocating trustees look "better" in society while not having any real monetary drawbacks. Consequently, introducing a proper incentive system might reduce the discrepancy between the trustee choices in the experiment and Li et al.'s (2018) results and possibly decrease the percentage of participants that did not pass the monotonicity checks for the choice lists.

A second limitation is the number of participants in each treatment. The number of participants required for the findings to have statistical power is 347, while the sample consisted of 66 participants after checking for breaches in monotonicity. The explanation of how many participants are necessary to achieve statistical power can be found in appendix B.

Another limitation is self-selection bias. More than 50% of the people that participated in the survey did not finish it, making their answers unusable. Furthermore, since participants relied solely on intrinsic motivators to complete the survey, the ones that answered the survey in its entirety might have specific traits that the other participants lacked. For example, the subjects that answered all questions might be more prosocial and consequently more likely to reciprocate the decision to trust by choosing the option that benefits both parties when taking the role of trustee. Therefore, self-selection bias is another potential reason the results deviate from Li et al.'s (2018).

The survey format brings forth an additional limitation, the trade-off between informing the subjects accurately and in a detailed manner with how long the survey can take before

subjects lose motivation or leave the survey. Furthermore, how long the survey takes plays an essential role in the accuracy of participant's responses and the completion of the survey.

Experimenting in a lab environment is a possible solution to diminish the impacts of the second and third limitations on the experiment. Since participants need to finish the experiment before leaving, longer and more complex experiments can be conducted, compared to online surveys, without worrying about losing participants midway. Additionally, the subjects do not suffer from unwanted distractions that decrease the accuracy of the results.

Lastly, the fifth limitation is the lack of diversity in the female and male pictures used in the survey. Although two sibling pairs were used to reduce noise caused by physical traits, the two sibling pairs cannot be considered representative of the whole population. Both sibling pairs had many similar physical traits, like eye color (both pairs have blue eyes), skin color (both pairs are Caucasian), and hair color (both pairs have brown hair). Therefore, it is necessary to have a sample of pictures that include racial and ethnic diversity and differences in hair color, eye color, body weight, and age to account for physical appearance. Physical appearance has been connected to perceived trustworthiness (Willis and Todorov 2006), so to accurately measure gender effects on perceived trustworthiness, other physical aspects independent from gender must be controlled.

3. A new experiment design

After looking at the main limitations of this work, I propose an improved and more robust version of the experiment conducted.

The first two ways to improve the experiment are: Experimenting in a lab environment and providing monetary incentives connected to the participant's performance in the experiment. The monetary incentive system can be the same as the one found in Li et al. (2018).

The experiment is divided into three phases, gathering the trustee group, evaluating the trustee group, and a final trust game. The first phase gathers participants to play the trust game in Li et al.'s (2018) work. However, the participants who play the trustee's role must be willing to have pictures taken of them that will be used in the subsequent phases of the

experiment. The pictures are not used in the first phase, only in the second and third. Preferably, the participants who play the role of trustee should form a physically diverse sample and represent the population.

In the second phase, evaluating the trustee group, new participants are exposed to the pictures taken of the participants from the first phase and asked how feminine or masculine the person in the picture looks. Based on the answers, each picture is given a score of how feminine/masculine it looks, representing how much the trustees' physical appearance deviates from gender stereotypes. This score is essential to evaluate the validity of the theoretical model proposed in this thesis because it serves as a comparison point to see how ambiguity attitudes can be affected by the gender of the trustee and how much the trustee's appearance deviates from the stereotypical image of a man or woman.

Lastly, a second trust game is conducted in the third phase. The new participants will first play the role of the trustor, similar to the experiment conducted in this thesis. The participants are divided into two treatments, male and female. In the male (female) treatment, participants play a trust game against one of the male (female) trustees from phase 1 and are exposed to a picture of them. The trust games played in phase 1 can serve as the control group since the participants are not exposed to a picture of their game partner.

I encourage researchers to use this improved experiment design as a guideline when designing their experiments to research how gender affects ambiguity attitudes in trust games.

Conclusion

In this work, I sought to determine whether the trustee's gender affects the trustor's ambiguity attitudes and the likelihood of trusting in trust games. This information is essential for corporations and individuals alike since trust permeates many social or business interactions and transactions in our daily lives. Although the effects of ambiguity attitudes (see Li et al. 2018) and the trustee's gender (see Buchan et al. 2008; Garbarino and Slonim 2009) on the trustor's decision to trust have been researched separately, there is no prior research that combines the two topics.

To glean some insights into the mechanisms behind the decision-making process of trusting, I developed a theoretical model that attempts to explain how the trustee's gender and the trustor's beliefs and ambiguity attitudes interact to influence the trustor's likelihood of trusting. The model proposes that decision-makers rely on stereotypes created through the representativeness heuristic to form beliefs about how a trustee of a particular gender is likely to act and look. Suppose the trustee's physical appearance deviates from the stereotypical image the trustor has of that gender. In that case, the trustor's beliefs are questioned, and their ambiguous attitudes change due to the cognitive dissonance derived from the discrepancy between the actual physical appearance of the trustee and the trustor's prior beliefs. This process is heuristic-based and performed by system 1.

The validity of the theoretical model and the research question was tested by adapting the trust game conducted by Li et al. (2018) to include the trustee's gender by separating the participants into three different treatments, control, female, and male. In the control group, no information about the trustee is provided, while in the female and male treatments, the participants are exposed to pictures of their game partner before playing the trust game.

The analysis of the data gathered with the help of the experiment did not provide evidence on the correctness and validity of the model since the trustee's gender and the trustor's ambiguity attitudes did not have significant effects on the likelihood to trust. Additionally, the trustee's gender did not significantly affect the trustor's ambiguity attitudes nor the variance of the trustor's decision to trust.

I argue that the lack of significant evidence to support the model stems partially from the limitations of the experiment: A small participant sample, no monetary incentives, self-

selection bias, a trade-off between the participant's understanding of the experiment prompts and duration of the experiment and a lack of diversity between pictures in the female and male treatments.

Considering the experiment's limitations, I propose an improved version that includes monetary incentives, a lab environment instead of an online survey format, a control to check whether the trustee's appearances deviate from stereotypical beliefs, and a method to get a more diversified image pool. The intention of proposing this improved experiment design is to provide a possible guideline for future research projects that seek to expand on how the mechanism behind trust relates to ambiguity attitudes and the trustee's gender and appearance.

Finally, further research into the topic is necessary to make definite conclusions about the validity of the results. A premature dismissal of the proposed theoretical model and the research topic should not be done lightly since alternative literature that focuses on why a person's appearance might affect their perceived trustworthiness, instead of how appearances affect perceived trustworthiness, is scarce.

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Appendix

A

A.1 Explanatory text for choice list task

The explanatory text about how choice lists work and on the task they need to perform is the following:

"In the following tasks you will compare two different types of payout and choose which one you prefer.

In the first payout option your game partner plays no role, while the second payout option depends on the choice made by your game partner.

This payout is in addition to the payout from the game you just played.

The two payouts have the following structure:

- ***€15 with the given probability:*** *If you choose this payout, you get €15 with the probability stated in the question.* ***Example:*** *If the question says "Probability is 40%", then you would get €15 an equivalent of 4 out of 10 times you choose this payout.*
- ***€15 if your partner chooses a certain option:*** *If you choose this payout, you get €15 euros only if your game partner chooses a certain option.*

On each page you will be asked to state your preference between the two payouts in the form of a choice list. In this list the given probability increases by 10% each line and can be found on the left column. You should state your preference in each line. Below you can find an example of how the list looks like:

	Please state your preference	
	€15 with the given probability	€15 if your partner chooses a certain option
Probability is 10%	○	○
Probability is 20%	○	○
Probability is 30%	○	○
Probability is 40%	○	○
Probability is 50%	○	○
Probability is 60%	○	○
Probability is 70%	○	○
Probability is 80%	○	○
Probability is 90%	○	○

The payout of the column '€15 with a given probability' increases its probability in each line according to the probabilities found on the left. The payout of the column '€15 if your partner chooses a certain option' does not change each line and the certain option will be specified on each page.
To make sure that you have understood the task, please answer the following questions correctly."

A.2 Remaining choice lists with text

Choice list 2:

"*Please state you preference between the two payouts.*

The payouts are:

- *€15 with a given probability;*
- *€15 if your partner chooses Option B, instead of Options A and C;*

***Remember**, the options your partner can choose are as follows:*

- ***Option A:** Pay **€15** to both of you;*
- ***Option B:** Pay you **€10**, pay your partner **€18**;*
- ***Option C:** Pay you **€8**, pay your partner **€22**;"*

	Please state your preference	
	€15 with the given probability	€15 if your partner chooses option B
Probability is 10%	○	○
Probability is 20%	○	○
Probability is 30%	○	○
Probability is 40%	○	○
Probability is 50%	○	○
Probability is 60%	○	○
Probability is 70%	○	○
Probability is 80%	○	○
Probability is 90%	○	○

Choice list 3:

"Please state you preference between the two payouts.

The payouts are:

- *€15 with a given probability;*
- *€15 if your partner chooses Option C, instead of Options A and B;*

***Remember**, the options your partner can choose are as follows:*

- ***Option A:** Pay **€15** to both of you;*
- ***Option B:** Pay you **€10**, pay your partner **€18**;*
- ***Option C:** Pay you **€8**, pay your partner **€22**;"*

	Please state your preference	
	€15 with the given probability	€15 if your partner chooses option C
Probability is 10%	○	○
Probability is 20%	○	○
Probability is 30%	○	○
Probability is 40%	○	○
Probability is 50%	○	○
Probability is 60%	○	○
Probability is 70%	○	○
Probability is 80%	○	○
Probability is 90%	○	○

Choice list 4:

"Please state you preference between the two payouts.

The payouts are:

- *€15 with a given probability;*
- *€15 if your partner chooses Option A or Option B, instead of Option C;*

***Remember**, the options your partner can choose are as follows:*

- ***Option A:** Pay **€15** to both of you;*
- ***Option B:** Pay you **€10**, pay your partner **€18**;*
- ***Option C:** Pay you **€8**, pay your partner **€22**;"*

	Please state your preference	
	€15 with the given probability	€15 if your partner chooses options A or B
Probability is 10%	○	○
Probability is 20%	○	○
Probability is 30%	○	○
Probability is 40%	○	○
Probability is 50%	○	○
Probability is 60%	○	○
Probability is 70%	○	○
Probability is 80%	○	○
Probability is 90%	○	○

Choice list 5:

"Please state you preference between the two payouts.

The payouts are:

- *€15 with a given probability;*
- *€15 if your partner chooses Option A or Option C, instead of Option B;*

***Remember**, the options your partner can choose are as follows:*

- ***Option A:** Pay **€15** to both of you;*
- ***Option B:** Pay you **€10**, pay your partner **€18**;*
- ***Option C:** Pay you **€8**, pay your partner **€22**;"*

	Please state your preference	
	€15 with the given probability	€15 if your partner chooses option A or C
Probability is 10%	○	○
Probability is 20%	○	○
Probability is 30%	○	○
Probability is 40%	○	○
Probability is 50%	○	○
Probability is 60%	○	○
Probability is 70%	○	○
Probability is 80%	○	○
Probability is 90%	○	○

Choice list 6:

"Please state you preference between the two payouts.

The payouts are:

- *€15 with a given probability;*
- *€15 if your partner chooses Option B or Option C, instead of Option A;*

***Remember**, the options your partner can choose are as follows:*

- ***Option A:** Pay **€15** to both of you;*
- ***Option B:** Pay you **€10**, pay your partner **€18**;*
- ***Option C:** Pay you **€8**, pay your partner **€22**;"*

	Please state your preference	
	€15 with the given probability	€15 if your partner chooses option B or C
Probability is 10%	○	○
Probability is 20%	○	○
Probability is 30%	○	○
Probability is 40%	○	○
Probability is 50%	○	○
Probability is 60%	○	○
Probability is 70%	○	○
Probability is 80%	○	○
Probability is 90%	○	○

A.3 Understanding questions

Question on risky prospect:

"*If you choose to get €15 with the given probability and the stated probability is 30%, how much money would you get?*"

Questions on single event ambiguous prospect:

1.

"If you choose to get €15 if your partner chooses Option A, instead of Options B and C, how much money would you get?
***Remember**, the options your partner can choose are as follows:*

- ***Option A:** Pay **€15** to both of you;*
- ***Option B:** Pay you **€10**, pay your partner **€18**;*
- ***Option C:** Pay you **€8**, pay you partner **€22**;"*

2.

"If you choose to get €15 if your partner chooses Option B, instead of Options A and C, how much money would you get?
***Remember**, the options your partner can choose are as follows:*

- ***Option A:** Pay **€15** to both of you;*
- ***Option B:** Pay you **€10**, pay your partner **€18**;*
- ***Option C:** Pay you **€8**, pay you partner **€22**;"*

3.

"If you choose to get €15 if your partner chooses Option C, instead of Options A and B, how much money would you get?
***Remember**, the options your partner can choose are as follows:*

- ***Option A:** Pay **€15** to both of you;*

- ***Option B:*** *Pay you* ***€10****, pay your partner* ***€18****;*
- ***Option C:*** *Pay you* ***€8****, pay you partner* ***€22****;"*

Questions about composite event ambiguous prospect :

1.

"If you choose to get €15 if your partner chooses Option A or Option B, instead of Option C, how much money would you get?
Remember*, the options your partner can choose are as follows:*

- ***Option A:*** *Pay* ***€15*** *to both of you;*
- ***Option B:*** *Pay you* ***€10****, pay your partner* ***€18****;*
- ***Option C:*** *Pay you* ***€8****, pay you partner* ***€22****;"*

2.

"If you choose to get €15 if your partner chooses Option A or Option C, instead of Option B, how much money would you get?
Remember*, the options your partner can choose are as follows:*

- ***Option A:*** *Pay* ***€15*** *to both of you;*
- ***Option B:*** *Pay you* ***€10****, pay your partner* ***€18****;*
- ***Option C:*** *Pay you* ***€8****, pay you partner* ***€22****;"*

3.

"If you choose to get €15 if your partner chooses Option B or Option C, instead of Option A, how much money would you get?
Remember*, the options your partner can choose are as follows:*

- ***Option A:*** *Pay* ***€15*** *to both of you;*
- ***Option B:*** *Pay you* ***€10****, pay your partner* ***€18****;*
- ***Option C:*** *Pay you* ***€8****, pay you partner* ***€22****;"*

B

B.1. Monotonicity checks

I performed two types of monotonicity checks. The first checked for stable preferences inside of the choice list. If the subject switched two or more times between columns, this is a breach of monotonicity, and the subject was removed from the sample.

The second type of monotonicity check was between the single event choice lists and composite event choice lists. For example, suppose a subject preferred a single event choice list to a composite event that includes the event from the single event choice list (the indifference point between risky and ambiguous prospects has a higher value in the single event choice list). In that case, this is considered a monotonicity breach. Since only 36 subjects had no breaches in this second type of monotonicity, I decided to add subjects to the sample that violated monotonicity a maximum of two times.

B.2. Statistical power

Finally, to gauge how many participants would be required for our models to achieve statistical power, I used the Gpower software to create an estimate. With an odds ratio of 1.4938, an α error probability of 0.05, and a 1-β error probability of 0.95, 347 participants would be necessary for our experiment for our logistic regressions to be statistically powerful.

C

C.1. Logit models with base category male

Logit no extra controls:

trustor	coefficient	SD	p-value
treatment			
control	-0.3435	0.6743	0.611
female	0.1447	0.5720	0.8
ambiguity			
aversion	-1.1900	0.7262	0.101
a-insensitivity	0.4919	0.6521	0.451
constant	-0.3089	0.5692	0.587

Logit with extra controls:

trustor	coefficient	SD	p-value
treatment			
control	0.0697	0.8902	0.938
female	0.3228	0.6748	0.632
ambiguity			
aversion	-1.5080	0.9923	0.129
a-insensitivity	0.7396	0.8500	0.384
age	-0.0251	0.0492	0.61
general trust	0.0511	0.0189	0.007
residence	0.6276	0.6597	0.341
gender	-0.3582	0.6510	0.582
constant	-2.7511	1.9318	0.154

C.2 OLS with male base category

OLS for ambiguity aversion index no extra controls:

ambiguity aversion	coefficient	SD	p-value
treatment			
control	-0.0310	0.1201	0.798
female	-0.0401	0.1118	0.721
constant	0.0095	0.0800	0.906

OLS for ambiguity aversion index with extra controls:

ambiguity aversion	coefficient	SD	p-value
treatment			
control	0.0504	0.1411	0.723
female	0.0698	0.1073	0.518
age	0.0095	0.0069	0.178
general trust	0.0002	0.0034	0.961
residence	-0.0833	0.0962	0.391
gender	0.0431	0.0986	0.664
constant	-0.2844	0.3104	0.364

OLS for a-insensitivity index with no controls:

a-insensitivity	coefficient	SD	p-value
treatment			
control	0.01	0.13	0.955
female	-0.03	0.12	0.784
constant	0.66	0.09	0

OLS for a-insensitivity index with extra controls:

a-insensitivity	coefficient	SD	p-value
treatment			
control	0.1662	0.1365	0.229
female	0.0222	0.1125	0.844
age	0.0087	0.0128	0.499
general trust	0.0037	0.0030	0.22
residence	-0.0666	0.1052	0.529
gender	0.1583	0.1103	0.157
constant	0.1418	0.3957	0.721