A Appendix: Supplementary Analysis, Tables & Figures

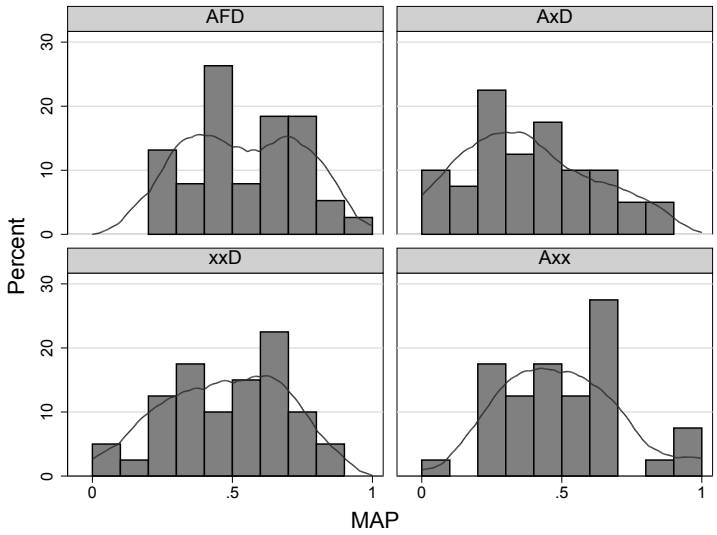

Figure 2: *(fig: HistKdensByTreatment) Histogram of MAPs by treatment (with Kernal Density)*

In Figure 2 we present histograms, overlaid with kernel density estimates, of principals' MAPs for each of our treatments separately. An important point to notice is that in all treatments a wide range of MAPs are reported, which makes it unlikely that our results are driven by a few outliers. A second point to notice is that the histograms and kernel density estimates tend to corroborate the story gleaned from comparing means. For example, the distribution of MAPs in our AxD treatment are essentially a leftward shift of the MAPs in our AFD treatment. Low MAPs (more trusting behavior) are more prevalent when we introduce noise into the mapping between co-player's action and outcomes, bringing down the average MAP for the AxD treatment.

In Figure 3 we present histograms from the pooled data, overlaid with kernel density estimates, of principals' MAPs for each of our treatments separately. As before, in all treatments a wide range of MAPs are reported making it unlikely that our results are driven by a few outliers. The histograms for the data from the follow up session are presented in Figure 4.

In Table 3 we report the output of the permutation test for the difference in means, for each between-treatment comparison. The permutation follows the permuted block design of the experiment, where permutations are stratified at the experimental session level. The second column lists the estimated difference between treatments. The third column counts the number of permutations (out of 100,000) where the difference was at least a large as the estimated difference. The fourth column lists the approximate p-values, the proportion of the permuted data where the difference is at least as large as the estimated difference.[31] The 95 percent confidence interval indicates the precision of the p-value, it is a binomial (Clopper-Pearson) confidence interval based on the 100,000 realizations from the permutation scheme.

In Table 4, for the purposes of comparison, we report the outcome of the T-test, in which the distribution of mean MAPs in each session is assumed to be normal.

[31] There exists exact p-values for this test, and the Monte-Carlo permutations can approximate them to arbitrary precision.

Table 3: *(tab: permuteCIs) For each pair-wise between-treatment difference in means, the results of the permutation test are reported below. In the final row, the test for follow-up session data is reported*

Comparison	Difference	Count	P-Value	St. Err.	[95% Conf.	Interval]
AFD vs. xxD	0.076**	4833	0.048	0.001	0.047	0.050
AFD vs. AxD	0.168***	22	0.000	0.000	0.000	0.000
AFD vs. Axx	0.040	18831	0.188	0.001	0.186	0.191
xxD vs. Axx	−0.036	78808	0.788	0.001	0.786	0.791
xxD vs. AxD	0.093**	3253	0.033	0.001	0.031	0.034
Axx vs. AxD	0.128***	381	0.004	0.000	0.003	0.004
Axx vs. AxD	0.043*	817	0.082	0.003	0.076	0.087

100,000 Permutations (player strata)

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$ (one-sided, right)

Table 4: *Below we can see that under the assumption of normality, the p-value of the T-test yields a close approximation of the exact p-value*

Comparison	Permutation	T-test
AFD vs. xxD	.0483	.0556
AFD vs. AxD	.0002	.0005
AFD vs. Axx	.1883	.2030
xxD vs. Axx	.7881	.7665
xxD vs. AxD	.0325	.0317
Axx vs. AxD	.0038	.0063

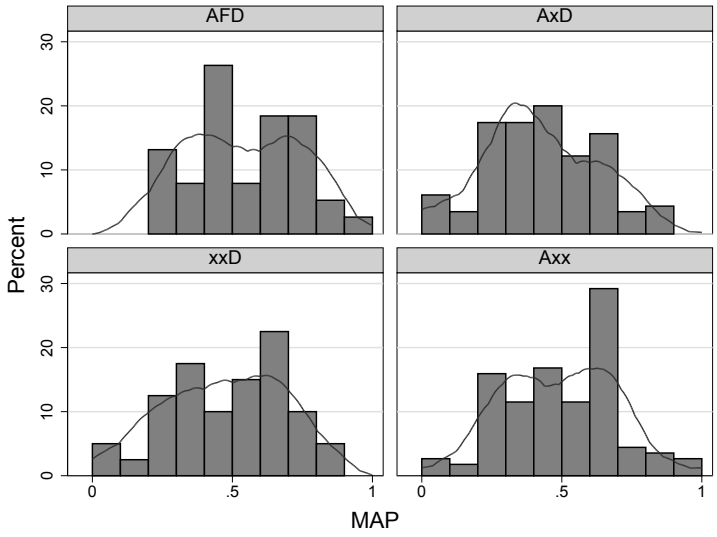

Figure 3: *(fig: HistKdensByTreatment-pooled) Histogram of MAPs from pooled sessions by treatment (with Kernel Density). See Section XX for separate histograms corresponding to the main sessions and follow-up sessions*

A.1 Power Analysis

The sample size for the follow-up sessions was determined by a power analysis informed by the reported MAPs from the main sessions. Concerning the power of the statistical tests in the main sessions, although we cannot know the distribution of the test statistic under the alternative (to the null) model which could have produced the effects we observed, we may take an agnostic approach and assume the empirical distributions of MAPs found in Figure 2 are the true distributions and bootstrap our power analysis by sampling (with replacement) from these distributions. We calculate the power of replicating an event as the fraction of samples that yield the event. We consider three events: (1) observing an effect of the same sign; (2) observing a significant effect of the same sign ($\alpha < .05$, one-sided); and (3) observing a significant effect of any sign ($\alpha < .05$). In Table 5 we report the power for each of these events based on the sample size of the original experiment.

If Result 4 is true with the observed distributions in Figure 2, then in an experiment with 40 subjects in each treatment the null hypothesis of equal means for treatments AxD and xxD will be rejected in favor of the directional alternative hypothesis with probability 0.64, whereas this probability is .86 for the test of equal means for treatments AxD and Axx. Using a sample size of 60 subjects in each treatment, the power increases to 0.95.

It may be the case that the magnitude of the difference in the main session, $MAP_{Axx} - MAP_{AxD} = -0.13$, was an extreme result and not representative of the true effect. Consequently, when determining statistical power one may want to consider smaller, yet still meaningful, effect sizes. Determining what a meaningful effect size is with the MAP measure is not straightforward, but in our view it is reasonable to consider as meaningful an effect size that is at least as large as the betrayal aversion effect size. The estimate of betrayal aversion in the main sessions was 0.07 with 78 subjects (n = 38 in AFD, n = 40 in xxD), which was smaller than in previous studies, though still quite close to that found by BZ in the city geographically closest to the laboratory of the present study (Zurich, Switzerland in Bohnet et al. (2010): 0.11 with 49 subjects (25 trust, 24

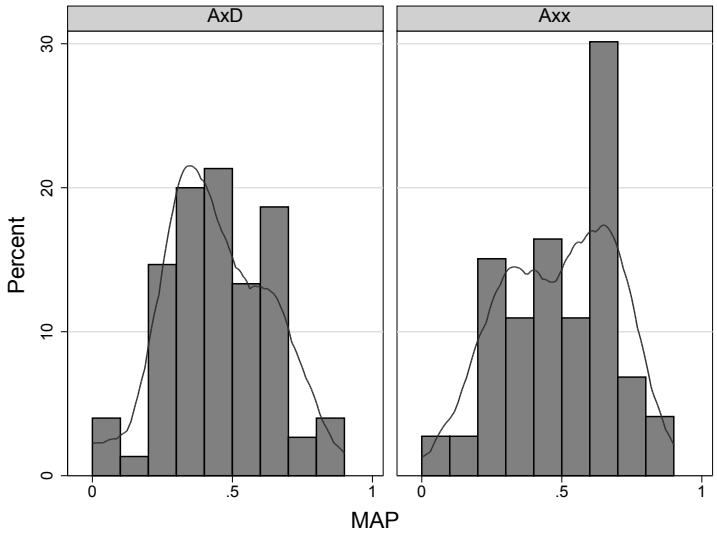

Figure 4: *(fig: HistKdensByTreatment-v2) Histogram of MAPs from follow-up sessions by treatment (with Kernal Density)*

risky dictator)).[32] The difference from the geographically closest study also happens to be equal to the effect size for the alternative formulation of Result 4 $MAP_{xxD} - MAP_{AxD} = -0.11$. Using a standard power analysis for a two-sample means test with means equal to the estimated means from Treatments xxD and AxD, and standard deviation equal to the estimated standard deviation of 0.22, we find that for a one-sided test, a sample size of 70 subjects per treatment will have a power of 0.90.

A.2 Survey Questions from follow-up sessions

We examine the ten post-experiment survey questions from the follow-up session to see if they might shed light on our three explanations for Result 4. Although the questions are not incentivized and are presented to subjects after their decisions have been made, in the analysis that follows we assume that subjects report what they perceived at the time they determined their MAP. We find that subjects' responses provide no support for the reference dependence hypothesis for the treatments in question, offer weak support for our hamstrung opponent hypothesis, and offer no support for the schadenfreude hypothesis (see footnote 22). Furthermore, we find that the survey questions related to the reference dependence hypothesis and to the hamstrung opponent hypothesis are correlated with MAPs at the individual level, and may therefore explain some of the between-subject variation in MAPs.

As an overview, in Figure 5 we plot mean responses and standard error bars for the ten survey questions by treatment. With respect to principals' reported preferences (Q4-Q6) and principals' perceptions of the agent's preferences (Q7-Q9), only Q7 is statistically significantly different across treatments ($p < .001$). This result shows that principals believe that the agents will be less satisfied with the non-delegation outcome of (10,10) in Treatment AxD, where agents are aware this is the outcome in which they earn the least, than in Treatment Axx where agents cannot know what

[32] Quercia (2016) finds an insignificant betrayal aversion effect size of 0.04 with more than twice the sample size of the original study (136 subjects), but with an alternative design finds a marginally significant effect size of 0.07 ($p < 0.10$), with 137 subjects.

Table 5: *The probability of replication based on bootstrap draws from the empirical distribution for an experiment with the same sample size. In the column "sign" is the probability of observing an effect of the same sign. In the column "One-sided" is the probability of observing a statistically significant effect ($\alpha < .05$) of the same sign, in the column "Two-Sided" is the probability of observing a statistically significant effect ($\alpha < .05$) of any sign with a two-sided t-test.*

Comparison	Sign	One-sided	Two-sided
AFD vs. xxD	.95	.49	.36
AFD vs. AxD	.99	.98	.95
AFD vs. Axx	.80	.23	.15
xxD vs. Axx	.76	.17	.10
xxD vs. AxD	.98	.64	.51
Axx vs. AxD	.99	.85	.77
(Axx + xxD) vs. AxD	.99	.86	.77

10,000 experiments with 40 subjects in each treatment.

they would have earned otherwise. This result is important as it serves as a manipulation check: principals understood from the instructions the epistemic state of the agent in each treatment.

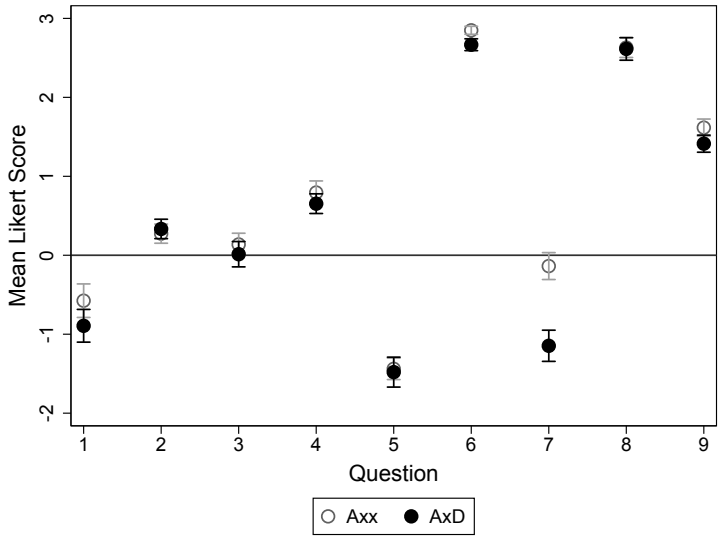

Figure 5: *(fig: Questions) Mean Likert score for each question (by treatment +/ − SEM)*

For reference dependence to explain Result 4, principals would need to believe that the fraction of agents choosing the good alternative (Q10) would be higher in Treatment Axx than in Treatment AxD. Instead, the responses to Q10 are essentially identical on average between these two treatments (0.43 in Treatment Axx and 0.44 in Treatment AxD). While it may be argued that subjects may not have responded meaningfully to these questions, in Treatment AxD, within individuals, responses to Q10 were significantly correlated with MAPs, with no significant correlation in Treatment Axx, suggesting that responses were not simply noise. We return to this point further below.

The hamstrung opponent hypothesis would predict that perception of threat (Q1) and perception of capability (Q3) would be lower in Treatment AxD than in Treatment Axx. While the responses are lower in Treatment AxD, the difference is not significant (p=0.14 for Q1 and p=0.28

for Q2, one-sided t-test). The explicit question about whether outcomes reflected the agent's intentions (Q2) is also not significantly different between treatments.

Finally, we find no support for the schadenfreude hypothesis. The prediction that, in Treatment AxD, the principal's satisfaction with $(15, 15)$ (Q6) would be negatively correlated with the the principal's perception of the agent's satisfaction (Q9) is not supported from the data. Moreover, as can be gleaned from Figure 5, there is no evidence that the principal's satisfaction with any outcome (Q4-Q6) is influenced by the treatment.

Beyond our three specific explanations for Result 4, the survey questions can be used to shed light on the determinants of MAPs more generally. In Figure 6, for each Likert question, we present the correlation between the question and the MAP across subjects. The correlations are plotted for each treatment. In Treatment AxD, MAPs are are highly significantly correlated with Q1 and Q10 ($p < 0.001$), whereas in Treatment Axx MAPs are highly significantly correlated with Q1 and Q4 ($p < 0.001$). For no other question is this correlation significant.

The positive correlation between responses to Q1 and MAPs in both treatments suggests that the perception of threat *does* influence the principal's willingness to expose herself to social risk, irrespective of the level of objective risk present.[33] The positive correlation between responses to Q10 and MAPs in Treatment AxD suggests expectations-driven reference dependence does play a role in determining MAPs as suggested by Aimone and Houser (2012). That this correlation is not evident in Treatment Axx suggests that reference dependence is more than simple numerical anchoring. One potential explanation is that when the agent is aware of the situation and can potentially desire the bad outcome, as in AxD, then the more improbable the bad outcome appears, the worse the principal anticipates feeling in the event that the agent successfully "chooses" the bad outcome.

The positive correlation between responses to Q4, relating to the principals' anticipated satisfaction with the non-delegation outcome $(10, 10)$ and MAPs in Treatment Axx, but not in Treatment AxD, is difficult to interpret. One would expect the association to be positive in both treatments. One, admittedly speculative, possibility is that in Treatment AxD, with the agent having a goal to associate with his actions, the principal devotes more attention to the potential actions of the agent, rather than the desirability of the outside option.

[33] Note that Q1 (threat) and Q10 (expected MAP) are not significantly correlated within each treatment.

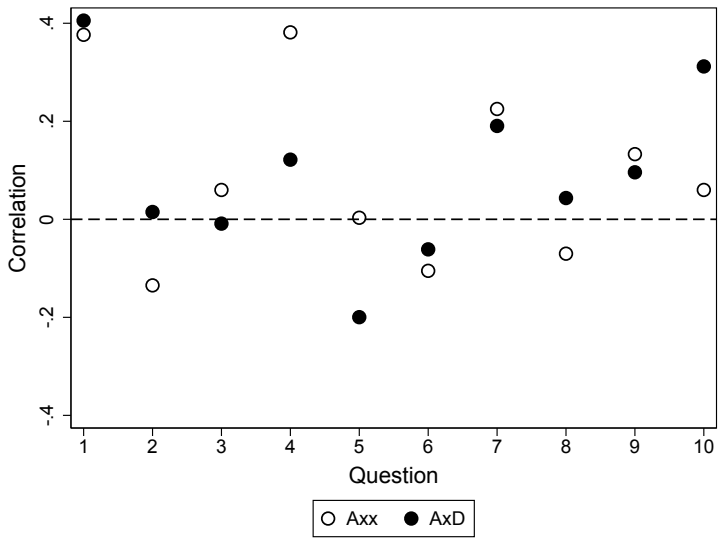

Figure 6: *(fig: Questions-Correlations) Correlation between Q1-Q10 and MAPs (by treatment)*

B Appendix: Experimental Procedures & Instructions

B.1 Procedures

Phase 1 One week before the main experiment sessions (phase 2) 11 students in the graduate program at Bocconi University were invited to take part in an experiment in room "Y". In a single session, these students participated as the second mover (Person Y) making a pre-commitment of their choice in response to the choice of the first mover (Person X) in every experimental treatment in the following order (1) Treatment Axx, (2) Treatment AxD, (3) Treatment xxD, and finally (4) Treatment AFD. For each treatment they were told that they are Person Y but they are to read the instructions for Person X as their instructions describe every aspect of the game.[34] These students returned after phase 2 of the study to receive their payment.

Phase 2 Participants were recruited from the Bocconi University online recruitment website administered by Sona-Systems (http://www.sona-systems.com/). Each session was given a unique title and description to minimize communication between participants.

When participants arrived they waited until all registered students were present and then were invited into the lab all at once. As they walked in, they selected "code" numbers out of a box and were told immediately: "You have been paired with a another participant".[35] Subjects were next instructed to seat themselves in the carrel corresponding to their code number. When they were seated the experimenter began with the "Experimenter Script' presented in Section B.2.

When the script was finished each instruction/decision sheet was folded in half and handed out. In each session there were four sets of instruction/decision sheets, one corresponding to each experimental treatment participants were assigned to. The selection of "code" numbers implemented a permuted block randomization, with a block size of 27 participants and a near-uniform allocation ratio (6,7,7,7).

Participants read the instructions privately and raised their hands to ask clarification questions. When instructions were complete participants filled out a quiz checking their understanding. Next quizzes were collected. Incorrect quizzes were identified by experimental assistants and replaced with a new blank quiz and participants were given an opportunity to ask questions again (the process continued until each participant could demonstrate understanding of the instructions).

After the instruction/decision sheet was collected from each participant they were handed a survey and a receipt form to fill out while the experimenter matched them with Room Y decisions and determined their payment.[36] Next participants were called up one-by-one to be paid based on the choice of the person from Room Y (phase 1) whom they were matched with.

Phase 3 Students from phase 1 (Room Y) returned one week after phase 2 and were paid for each treatment they participated in. For each treatment their earnings from each participant they were matched with were pooled together. They were paid based on a random selection from their pooled earnings from each treatment. Participants in Room X were not informed that the matching and the payment for participants in Room Y would be conducted precisely in this manner.

[34] In Treatment Axx there were no instructions, subjects were simply asked to choose a box.

[35] This was for the random pairing with Room Y participants.

[36] The specific implementation of the matching was not described to the participants of Room X, only that they were uniquely matched with a student from Room Y. The matching was many-to-one and only participants in Room Y were aware of this.

B.2 Experimenter Script (English Translation): Room X Sessions

1. (Once everyone is seated) Welcome to the study and thank you for participating.

2. First, we ask you to please turn off your mobile devices, not communicate between each other, and leave your desk clear of everything except your student ID and a pen. We will not be using the computers.

3. We will give you a brief overview of the study. It is important that you listen closely. You may ask questions once we have finished reading the instructions (which we will hand to you shortly)

4. This is Room X. When you selected a code number as you walked in this room you were randomly matched with one of the student participants in Room Y. Your identity will be anonymous to them, and theirs to you.[37]

5. In this study you will make a single decision that may influence both your payoffs and the payoffs of the person you are matched with. Please note that there is not a correct or incorrect response, your decision is personal and yours to make.

6. The study will go as follows:

   (a) You will read the instructions which we will hand to you in a moment.

   (b) You will answer a short quiz. This quiz will be handed to you just after the instructions are finished. The purpose of the quiz is to confirm that you haver perfectly understood the instructions. Be careful, it is important that you answer the key question that you will find on the first page of the instructions *after* you have successfully completed the quiz.

   (c) Once you have completed the quiz, and after we have checked the correctness of the answers, you can answer the Key Question (the one and only real decision you will make during the course of the experiment!). Keep in mind that there is no relationship between the answers in the quiz and the answer you'll have to give the key question!

   (d) When everyone has finished we will collect your choices, leave and match your choices with the responses from Room Y, and return.

   (e) While you wait for us to calculate the amount of your winnings, we will hand out a form asking for your feedback and comments. We will also distribute a survey which is completely anonymous, but there are some personal questions so if you prefer not to respond to some of these, feel absolutely free not to.

   (f) When we are ready to proceed with payments, after collecting all of the surveys, we will call you one by one to the front of the room. You will need to bring with you the little number that we gave away at the entrance, the completed receipt form (which will be delivered towards the end of the experiment), your student ID, and all your belongings so that you can leave immediately without disturbing others.

[37] The Room X and Y designation were chosen so to make it apparent that identities would be kept anonymous. If a participant asked for more details about Room Y students, we responded to specific question, this happened twice. In reality the students in Room Y decided a few days before students in Room X decided and were paid a few days after. We did not reveal this information to keep the saliency of betrayal high.

7. We are nearly ready to have you begin reading the instructions. I would like to emphasize one more time that you read the instructions carefully. This is in your best interest because your earnings from this experiment depend largely on your our answer to the Key Question, the only decision you will make today that has monetary consequences. We remind you, please do not respond to the key question until you have completely read the instructions and responded to the brief quiz.

8. We are now ready, we will give you the instructions, and after a couple of minutes we will hand you the quizzes. Please write your code number ("little number") at the top of each sheet, so as to avoid confusion with the payments. We will now pause to answer any general questions, please raise your hand and we will come around to you individually.

9. Thank you for your attention, you may begin the instructions. If you have a question at any point, please raise your hand and we will come around to respond.

B.3 Instructions *Treatment AFD* (English Translation):

Welcome to the research project! Your code number is: .....
You are participating in a study in which you will earn some money. The amount you earn will depend on the outcome of a game you will play. At the end of the study, your earnings will be added to your participation fee of 5 Euros, and you will be paid in cash.

How the study is conducted. The study is conducted anonymously. Participants will be identified only by code numbers. There is no communication among them. You have been randomly paired with another participant in Room Y, call him/her "**Person Y**". Person Y will never know your identity and you will never know Person Y's identity. Your choices are identified solely by your code number and will never be disclosed to anyone. Both you and Person Y are equally informed of these instructions.

What the study is about. The study seeks to understand how people decide. You will decide between two alternatives, A and B. Alternative A gives you a certain payoff that does not depend on the choice of Y. Alternative B gives you an outcome that depends on Y's behavior. Y chooses between options **J** and **K**.

Payoff Table The payoff table reads as follows:

Result of your decision	Nature of choice	Your earnings	Earnings of Person Y
Alternative A	Certainty	10	10
Alternative B	Person Y chooses		
	Option J	15	15
	Option K	8	22

The payoff table is as follows

- If you choose A: you and Person Y will each earn 10 Euros.
- If you choose B:
  - If Person Y chooses J, you and Person Y will each earn 15 Euros.
  - If Person Y chooses K, you will earn 8 Euros and Person Y will earn 22 Euros

KEY QUESTION: For you to choose Alternative B instead of Alternative A, how large would the probability p of being paired with a Person Y who chooses option J minimally have to be? (like any probability, it must lie between 0 and 1)

YOUR ANSWER: I will choose alternative B for any p that is at least ☐ ⟵
(this means that I choose alternative A for any p that is less than this cutoff)

Note: You do not know what the actual value of p is. Your choice does not influence the value of p. It is determined by the fraction of persons Y choosing option J. With YOUR ANSWER you indicate how large the fraction of persons Y who choose J has to be before you pick B over A. This is explained in detail on the next page

Conduct of the study C.1.

1. Before knowing your choice, Person Y has to answer the following question: "Which option, J or K, do you choose in case B?" Everyone will decide in this way. After everyone has decided, we will collect the answer forms. Please fold them so that nobody can see YOUR ANSWER.
2. We will then calculate the percentage of persons Y who chose option J and inform everyone of it. This gives $p*$, the probability of being paired with a Person Y who chose option J.
3. **If $p*$ is greater than or equal to your required value of p (from YOUR ANSWER above), we will follow your instructions. Your earnings will be determined by the choice of the Person Y you are matched with.**
   (a) If your Person Y chose J, you and Person Y will earn 15 Euros each.
   (b) If your Person Y chose K, you will earn 8 Euros and Person Y will earn 22 Euros.
4. **If $p*$ is less than your required value of p (from YOUR ANSWER above), we will follow your instructions: You and your Person Y will get the outcome of the certain choice A, namely 10 Euros each.**

Completion of Study and Earnings.

- Before we conduct the study, we ask you to complete a pre-study questionnaire. We will start the study once everyone has correctly filled out this questionnaire.
- You can collect your earnings by presenting your CODE NUMBER FORM at the end of the study. Your earnings will be in an envelope marked with your code number.

B.4 Instructions *Treatment xxD* (English Translation):

Welcome to the research project! Your code number is: .....
You are participating in a study in which you will earn some money. The amount you earn will depend on the outcome of a game you will play. At the end of the study, your earnings will be added to your participation fee of 5 Euros, and you will be paid in cash.

How the study is conducted. The study is conducted anonymously. Participants will be identified only by code numbers. There is no communication among them. You have been randomly paired with another participant in Room Y, call him/her "**Person Y**". Person Y will never know your identity and you will never know Person Y's identity. Your choices are identified solely by your code number and will never be disclosed to anyone. Both you and Person Y are equally informed of these instructions.

What the study is about. The study seeks to understand how people decide. You are confronted with two alternatives, A and B. Alternative A gives you and Person Y a payoff of 10 Euros for sure. Alternative B gives you an outcome that depends on which option (**J** or **K**) is chosen for Y. Each of the 17 cells below contains one symbol, either J or K. The symbols are visible to Person Y but not to you.

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17

Using the online random number service www.random.org, a number between 1 and 17 will be randomly selected for Person Y. If the corresponding cell of the number selected contains J that means option J is selected for Person Y, if the cell contains K that means option K is selected for Person Y.
Payoff Table The payoff table reads as follows:

Result of your decision	Nature of choice	Your earnings	Earnings of Person Y
Alternative A	Certainty	10	10
Alternative B	Selection for Person Y		
	Option J	15	15
	Option K	8	22

The payoff table is as follows

- If you choose A: you and Person Y will each earn 10 Euros.
- If you choose B:
  - If option J is selected for Person Y, you and Person Y will each earn 15 Euros.
  - If option K is selected for Person Y, you will earn 8 Euros and Person Y will earn 22 Euros

KEY QUESTION: For you to choose Alternative B instead of Alternative A, how large would the probability p of being paired with a Person Y where option J is selected for them minimally have to be? (like any probability, it must lie between 0 and 1)

YOUR ANSWER: I will choose alternative B for any p that is at least ☐ ⟵
(this means that I choose alternative A for any p that is less than this cutoff)

Note: You do not know what the actual value of p is. Your choice does not influence the value of p. It is determined by the fraction of persons Y who have option J selected for them. With YOUR ANSWER you indicate how large the fraction of persons Y who have option J selected for them has to be before you pick B over A. This is explained in detail on the next page

Conduct of the study C.1.

1. After all the options have been selected for those in Room Y, we will first calculate the percentage of people in Room Y who have had option J selected for them and inform everyone of it. This gives $p*$, the probability of being paired with a Person Y who has had option J selected for them.
2. **If $p*$ is greater than or equal to your required value of p (from YOUR ANSWER above), we will follow your instructions. Your earnings will be determined by the option selected for the Person Y you are matched with.**
   (a) If your Person Y had option J selected for them, you and your Person Y will earn 15 Euros each.
   (b) If your Person Y had option K selected for them, you will earn 8 Euros and your Person Y will earn 22 Euros.
3. **If $p*$ is less than your required value of p (from YOUR ANSWER above), we will follow your instructions: You and your Person Y will get the outcome of the certain choice A, namely 10 Euros each.**

Completion of Study and Earnings.

- Before we conduct the study, we ask you to complete a pre-study questionnaire. We will start the study once everyone has correctly filled out this questionnaire.
- You can collect your earnings by presenting your CODE NUMBER FORM at the end of the study. Your earnings will be in an envelope marked with your code number.

B.5 Instructions *Treatment Axx* (English Translation):

Welcome to the research project! Your code number is: .....
You are participating in a study in which you will earn some money. The amount you earn will depend on the outcome of a game you will play. At the end of the study, your earnings will be added to your participation fee of 5 Euros, and you will be paid in cash.

How the study is conducted. The study is conducted anonymously. Participants will be identified only by code numbers. There is no communication among them. You have been randomly paired with another participant in Room Y, call him/her "**Person Y**". Person Y will never know your identity and you will never know Person Y's identity. Your choices are identified solely by your code number and will never be disclosed to anyone.

What the study is about. The study seeks to understand how people decide. You are confronted with two alternatives, A and B. Alternative A gives you a certain payoff that does not depend on the choice of Y. Alternative B gives you an outcome that depends on Y's behavior. *Persons Y are not aware they are matched with anyone or that any payoffs depend on their behavior.* Each of the 17 cells below contains one symbol, either J or K. The symbols are not visible to you or Person Y.

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17

Without knowing the purpose, Person Y will blindly choose one of the 17 cells below. If the chosen cell contains J, that means Person Y has selected option J. If the chosen cell contains K that means Person Y has selected option K.
Payoff Table The payoff table reads as follows:

Result of your decision	Nature of choice	Your earnings	Earnings of Person Y
Alternative A	Certainty	10	10
Alternative B	Person Y chooses		
	Option J	15	15
	Option K	8	22

The payoff table is as follows

- If you choose A: you and Person Y will each earn 10 Euros.
- If you choose B:
  - If Person Y chooses the number that corresponds to option J, you and Person Y will each earn 15 Euros.
  - If Person Y chooses the number that corresponds to option K, you will earn 8 Euros and Person Y will earn 22 Euros

KEY QUESTION: For you to choose Alternative B instead of Alternative A, how large would the probability p of being paired with a Person Y who chooses a number that corresponds to option J minimally have to be? (like any probability, it must lie between 0 and 1)

YOUR ANSWER: I will choose alternative B for any p that is at least ☐ ⟵
(this means that I choose alternative A for any p that is less than this cutoff)

Note: You do not know what the actual value of p is. Your choice does not influence the value of p. It is determined by the fraction of persons Y who chose a number corresponding to option J. With YOUR ANSWER you indicate how large the fraction of persons Y who chose a number corresponding to option J has to be before you pick B over A. This is explained in detail on the next page

Conduct of the study C.1.

1. After all everyone has made their decision, we will first calculate the percentage of people in Room Y who have chosen a number corresponding to option J and inform everyone in Room X of it. This gives $p*$, the probability of being paired with a Person Y who has chosen a number corresponding to option J.
2. **If $p*$ is greater than or equal to your required value of p (from YOUR ANSWER above), we will follow your instructions. Your earnings will be determined by the choice of the Person Y you are matched with.**
   (a) If your Person Y has chosen a number corresponding to option J, you and your Person Y will earn 15 Euros each.
   (b) If your Person Y has chosen a number corresponding to option K, you will earn 8 Euros and your Person Y will earn 22 Euros.
3. **If $p*$ is less than your required value of p (from YOUR ANSWER above), we will follow your instructions: You and your Person Y will get the outcome of the certain choice A, namely 10 Euros each.**

Completion of Study and Earnings.

- Before we conduct the study, we ask you to complete a pre-study questionnaire. We will start the study once everyone has correctly filled out this questionnaire.
- You can collect your earnings by presenting your CODE NUMBER FORM at the end of the study. Your earnings will be in an envelope marked with your code number.

B.6 Instructions *Treatment AxD* (English Translation):

Welcome to the research project! Your code number is: .....
You are participating in a study in which you will earn some money. The amount you earn will depend on the outcome of a game you will play. At the end of the study, your earnings will be added to your participation fee of 5 Euros, and you will be paid in cash.

How the study is conducted. The study is conducted anonymously. Participants will be identified only by code numbers. There is no communication among them. You have been randomly paired with another participant in Room Y, call him/her "**Person Y**". Person Y will never know your identity and you will never know Person Y's identity. Your choices are identified solely by your code number and will never be disclosed to anyone. Both you and Person Y are equally informed of these instructions.

What the study is about. The study seeks to understand how people decide. You are confronted with two alternatives, A and B. Alternative A gives you a certain payoff that does not depend on the choice of Y. Alternative B gives you an outcome that depends on Y's behavior. Each of the 17 cells below contains one symbol, either **J** or **K**. The symbols are not visible to you or Person Y.

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17

Person Y will blindly choose one of the 17 cells. If the chosen cell contains J, that means Person Y has selected option J. If the chosen cell contains K that means Person Y has selected option K. This means that regardless of which option Person Y prefers, the option will be selected only if Person Y's number choice yields that option.
Payoff Table The payoff table reads as follows:

Result of your decision	Nature of choice	Your earnings	Earnings of Person Y
Alternative A	Certainty	10	10
Alternative B	Person Y chooses		
	Option J	15	15
	Option K	8	22

The payoff table is as follows

- If you choose A: you and Person Y will each earn 10 Euros.
- If you choose B:
  - If Person Y chooses the number that corresponds to option J, you and Person Y will each earn 15 Euros.
  - If Person Y chooses the number that corresponds to option K, you will earn 8 Euros and Person Y will earn 22 Euros

KEY QUESTION: For you to choose Alternative B instead of Alternative A, how large would the probability p of being paired with a Person Y who chooses a number that corresponds to option J minimally have to be? (like any probability, it must lie between 0 and 1)

YOUR ANSWER: I will choose alternative B for any p that is at least ☐ ⟵
(this means that I choose alternative A for any p that is less than this cutoff)

Note: You do not know what the actual value of p is. Your choice does not influence the value of p. It is determined by the fraction of persons Y who chose a number corresponding to option J. With YOUR ANSWER you indicate how large the fraction of persons Y who chose a number corresponding to option J has to be before you pick B over A. This is explained in detail on the next page

Conduct of the study C.1.

1. After all everyone has made their decision, we will first calculate the percentage of people in Room Y who have chosen a number corresponding to option J and inform everyone in Room X of it. This gives $p*$, the probability of being paired with a Person Y who has chosen a number corresponding to option J.
2. **If $p*$ is greater than or equal to your required value of p (from YOUR ANSWER above), we will follow your instructions. Your earnings will be determined by the choice of the Person Y you are matched with.**
   (a) If your Person Y has chosen a number corresponding to option J, you and your Person Y will earn 15 Euros each.
   (b) If your Person Y has chosen a number corresponding to option K, you will earn 8 Euros and your Person Y will earn 22 Euros.
3. **If $p*$ is less than your required value of p (from YOUR ANSWER above), we will follow your instructions: You and your Person Y will get the outcome of the certain choice A, namely 10 Euros each.**

Completion of Study and Earnings.

- Before we conduct the study, we ask you to complete a pre-study questionnaire. We will start the study once everyone has correctly filled out this questionnaire.
- You can collect your earnings by presenting your CODE NUMBER FORM at the end of the study. Your earnings will be in an envelope marked with your code number.

Your code number is: ……. **QUIZ**

Question 1: Suppose there are 20 participants in room Y and option J is selected 8 times while option K is selected 12 times what is the actual probability p* of a participant in room Y choosing option J?

a) .3
b) .4
c) .8
d) .12
e) None of the above

Question 2: As in the last question, suppose there are 20 participants in room Y and option J is selected 8 times while option K is selected 12 times. If you choose a minimum probability p of .45, which alternative will you end up choosing after we calculate the actual p* based on the responses from the other room.

a) Alternative A
b) Alternative B

Question 3: Suppose there are 20 participants in room Y and the minimum probability p you choose is .75, how many times would option J have to be selected for you to choose alternative A?

a) 4 or more
b) 5 or more
c) 10 or more
d) 15 or more
e) 16 or more
f) None of the above

Question 4: If there are 20 participants in room Y and the minimum probability p you choose is .20, how many time would option J have to be selected for you to choose alternative A?

a) 4 or more
b) 5 or more
c) 10 or more
d) 15 or more
e) 16 or more
f) None of the above

Question 5: Suppose there are 20 participants in room Y and option J is selected 12 times while option K is selected 8 times. If you choose a minimum probability p of .55, which alternative will you end up choosing after we calculate p* based on the responses from the other room.

a) Alternative A
b) Alternative B

C Appendix: Survey Questions

The survey questions subjects responded to are reported on the following pages. The purpose of the survey questions were to detect evidence for: (1) the *hamstrung opponent hypothesis*, (2) the *schadenfreude hypothesis*, and (3) *expectations-based reference dependence hypothesis*.[38] With regard to the *hamstrung opponent hypothesis*, Q1 and Q3 were intended to assess the principal's perception of how threatening and capable the agent was. If subjects are able to report their emotional state at the time they made their decision, the hamstrung opponent hypothesis would predict that their reports to Question 1 and 3 would be lower in Treatment AxD than in Treatment Axx. If, instead, subjects respond to the questions based on the objective information they have, then their reports should be identical in both treatments. Without any reason to report higher values in Treatment AxD, if sufficiently many subjects accurately report their emotional state at the time they made their decision, the questions should be able to detect if the treatments manipulated perceptions of threat and capability. The questions Q4 through Q9 were intended to assess how satisfied the principal anticipated being with each outcome, and how satisfied the principal expected the agent to be with each outcome. In terms of the *schadenfreude hypothesis*, if in Treatment AxD the principals' anticipated satisfaction with the favorable outcome (Q6) is negatively correlated with principals' perception of the agents' satisfaction with same outcome (Q9) but the correlation does not hold in Treatment Axx, then the schadenfreude hypothesis would find support. Questions 4,5,7, and 8 were included for completeness and to avoid unduly priming subjects about the purpose of the questions. Finally, with respect to the *reference dependence* explanation, Q10 was intended to assess the principal's perceived subjective probability of being matched with an agent who chooses the favorable outcome $(15, 15)$.

[38] See Section 4.1.1, and footnote 22.

Question 1: How threatening do you consider the participant you were paired with in Room Y to be?

Completely unthreatening			Neither threatening nor unthreatening			Completely threatening
-3	-2	-1	0	1	2	3

Question 2: To what extent do you feel the outcome will reflect the *intentions* of the participant you were paired with in Room Y ?

Will be completely opposite to his/her intentions			neither			Will completely reflect his/her intentions
-3	-2	-1	0	1	2	3

Question 3: With respect to achieving his or her goals, how competent (capace) do you consider the participant you were paired with in Room Y to be?

Completely incompetent			Neither incompetent nor competent			Completely competent
-3	-2	-1	0	1	2	3

Question 4: Imagine you have just learned the outcome is (10,10). How satisfied will you be?

Completely unsatisfied			Neither satisfied nor unsatisfied			Completely satisfied
-3	-2	-1	0	1	2	3

Question 5: Imagine you have just learned the outcome is (8,22). How satisfied will you be?

Completely unsatisfied						Completely satisfied
-3	-2	-1	0	1	2	3

Question 6: Imagine you have just learned the outcome is (15,15). How satisfied will you be?

Completely unsatisfied			Neither satisfied nor unsatisfied			Completely satisfied
-3	-2	-1	0	1	2	3

Question 7: Imagine you have just learned the outcome is (10,10). How satisfied will the participant you were paired with in Room Y be?

Completely unsatisfied			Neither satisfied nor unsatisfied			Completely satisfied
-3	-2	-1	0	1	2	3

Question 8: Imagine you have just learned the outcome is (8,22). How satisfied will the participant you were paired with in Room Y be?

Completely unsatisfied			Neither satisfied nor unsatisfied			Completely satisfied
-3	-2	-1	0	1	2	3

Question 9: Imagine you have just learned the outcome is (15,15). How satisfied will the participant you were paired with in Room Y be?

Completely unsatisfied			Neither satisfied nor unsatisfied			Completely satisfied
-3	-2	-1	0	1	2	3

Question 10: In your opinion, what is the probability of being paired with a Person in Room Y that chooses a number that corresponds to option J?

_____