APPENDIX

Appendix A: Instructions Study 1

In the following, the instruction and decision sheets used in study 1 are provided. The instructions are translated into English and are scaled down. The following instructions and decision sheets are for player A.

[page 1]

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A decision situation is described on the next page. Please read the description carefully and make a decision afterwards. The description should be self-explanatory. Unfortunately, the experimenter will not be able to answer any questions. If you have any questions, please read the instructions again. After the experiment has already started, please stop talking.

Please answer the following general questions:

female ? male ?

Age: …….

Profession: …….

Thanks a lot for your participation.

[page 2]

Decisions between two persons

In the following experiment you will be paired with another participant. This person is not present in the room. You will not know who this other person is. Likewise, the other person will not be informed whom he or she is paired with. Your decisions are anonymous.

You and the other person will get an endowment of DM 10.

You have to decide which portion of your endowment you want to send to the other person. The amount you send to the other person will be multiplied by three. The other Person decides which portion of the trebled amount she or he wants to keep, and how much she or he wants to return to you. The other person cannot send any portion of her or his endowment to you.

Your payoff consists of the amount of money you kept plus the returned amount. The other person gets his or her endowment plus the amount he or she did not return.

Examples:

A If you send no money, then you and the other person will be paid the endowment of DM 10.

B If you send DM 10, then this yields DM 30. If the other person returns DM 10 of this amount, then you will obtain these DM 10. The other person gets to keep DM 20 and the endowment of 10 DM (in total DM 30).

C If you send DM 7, then this yields DM 21. If the other person returns DM 8 of this amount, then you will obtain these DM 8 and the DM 3 you did not send (in total DM 11). The other person gets to keep DM 13 and the endowment of 10 DM (in total DM 23).

[low incentive condition]
After you have made your decision, you will get 50% of your payoffs and the experiment ends.
[high incentive condition]
After you have made your decision, you will get your payoffs and the experiment ends.

If you understood everything, you can proceed to the next page and make your decisions.

[page 3]

Before you make your decision, first a little question for your understanding.

Suppose you send DM 8 and the other persons returns DM 20 of the trebled amount to you.
What is now your payoff and the other person's payoff. If you like, please go back to the description of the experiment of the previous page. You can also make notes.

I get	DM	.....
The other person gets	DM	.....

[page 4]

Please make your decision now!

You decide how much of your endowment of DM 10 you want to send to the other person. After your decision your payoff will be determined, which depends on your decision and the other person's decision.

From my endowment I will send DM

?	?	?	?	?	?	?	?	?	?	?
0.00	1.00	2.00	3.00	4.00	5.00	6.00	7.00	8.00	9.00	10.00

to the other person.

[end of decision sheet]

The following instructions and decision sheets were for player B. The instructions and the decision sheet are translated into English and partially scaled down.

[page 1]

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On the next page a decision situation is described. Please read the description carefully and make a decision afterwards. The description should be self-explanatory. Please note that the experimenter will not be able to answer any questions. If you have any questions, please read the instructions again. After the experiment has already started, please stop talking.

Please answer the following general questions:

female ? male ?

Age: …….

Profession: …….

Thanks a lot for your participation.

[page 2]

Decisions between two persons

In the following experiment, you will be paired with another participant. This person is not present in the room. You will not know who this other person is. Likewise, the other person will not be informed whom he or she is paired with. Your decisions are anonymous.

You and the other person will get an endowment of DM 10.

The decision of the other person is to send any amount of his or her endowment to you. The sent amount will be multiplied by three. You decide which portion of the trebled amount you want to keep, and how much you want to return to the other person. You cannot send any portion of your endowment to the other person.

Your payoff consists of the endowment plus the amount kept. The other person gets whatever amount he or she kept and the money you returned to the other person.

Examples:

A If the other person sends no money, then you and the other person will be paid the endowment of DM 10.

B If the other person sends DM 10, then this yields DM 30. If you return DM 10 of this amount, then the other person will obtain these DM 10. You will get the DM 20 you kept and the endowment of 10 DM (in total DM 30).

C If the other person sends DM 7, then this yields DM 21. If you return DM 8 of this amount, then the other person will obtain these DM 8 and the DM 3 the other person did not send (in total DM 11). You get the DM 13 you kept and the endowment of 10 DM (in total DM 23).

[low incentive condition]
After you have made your decision, you will get 50% of your payoffs and the experiment ends.
[high incentive condition]
After you have made your decision you will get your payoffs and the experiment ends.

If you have understood everything, you can proceed to the next page and make your decisions.

[page 3]

Before you make your decision first a little question for your understanding.

Suppose the other person sends DM 8 to you and you return DM 20 of the trebled amount to the other person. What is now your payoff and the other person's payoff. If you like, please go back to the description of the experiment of the previous page. You can also make notes.

I get	DM	.....
The other person gets	DM	.....

[page 4]

Please make your decision now!

You have to make a decision for all possible decisions of the other person. For all possible amounts the other person could send to you, please select the amount you will return to the other person. After your decision your payoff will be determined, which depends on your decision and the other person's decision.

In case the other person sends **DM 1.00**, this yields **DM 3.00.**
I return DM

?	?	?	?	?	?	?
0.00	0.50	1.00	1.50	2.00	2.50	3.00

to the other person.

In case the other person sends **DM 2.00**, this yields **DM 6.00.**
I return DM

?	?	?	?	?	?	?	?	?	?	?	?
0.00	0.50	1.00	1.50	2.00	2.50	3.00	3.50	4.00	4.50	5.00	5.50
?											
6.00											

to the other person.

In case the other person sends **DM 3.00**, this yields **DM 9.00.**
I return DM

?	?	?	?	?	?	?	?	?	?	?	?
0.00	0.50	1.00	1.50	2.00	2.50	3.00	3.50	4.00	4.50	5.00	5.50
?	?	?	?	?	?	?					
6.00	6.50	7.00	7.50	8.00	8.50	9.00					

to the other person.

In case the other person sends **DM 4.00**, this yields **DM 12.00.**
I return DM

?	?	?	?	?	?	?	?	?	?	?	?
0.00	0.50	1.00	1.50	2.00	2.50	3.00	3.50	4.00	4.50	5.00	5.50
?	?	?	?	?	?	?	?	?	?	?	?
6.00	6.50	7.00	7.50	8.00	8.50	9.00	9.50	10.00	10.50	11.00	11.50
?											
12.00											

to the other person.

In case the other person sends **DM 5.00**, this yields **DM 15.00.**
I return DM

?	?	?	?	?	?	?	?	?	?	?	?
0.00	0.50	1.00	1.50	2.00	2.50	3.00	3.50	4.00	4.50	5.00	5.50
?	?	?	?	?	?	?	?	?	?	?	?
6.00	6.50	7.00	7.50	8.00	8.50	9.00	9.50	10.00	10.50	11.00	11.50
?	?	?	?	?	?	?					
12.00	12.50	13.00	13.50	14.00	14.50	15.00					

to the other person.

In case the other person sends **DM 6.00**, this yields **DM 18.00.**
I return DM

?	?	?	?	?	?	?	?	?	?	?	?
0.00	0.50	1.00	1.50	2.00	2.50	3.00	3.50	4.00	4.50	5.00	5.50
?	?	?	?	?	?	?	?	?	?	?	?
6.00	6.50	7.00	7.50	8.00	8.50	9.00	9.50	10.00	10.50	11.00	11.50
?	?	?	?	?	?	?	?	?	?	?	?
12.00	12.50	13.00	13.50	14.00	14.50	15.00	15.50	16.00	16.50	17.00	17.50
?											
18.00											

to the other person.

[page 5]

In case the other person sends **DM 7.00**, this yields **DM 21.00.**
I return DM

?	?	?	?	?	?	?	?	?	?	?	?
0.00	0.50	1.00	1.50	2.00	2.50	3.00	3.50	4.00	4.50	5.00	5.50
?	?	?	?	?	?	?	?	?	?	?	?
6.00	6.50	7.00	7.50	8.00	8.50	9.00	9.50	10.00	10.50	11.00	11.50
?	?	?	?	?	?	?	?	?	?	?	?
12.00	12.50	13.00	13.50	14.00	14.50	15.00	15.50	16.00	16.50	17.00	17.50
?	?	?	?	?	?	?					

18.00 18.50 19.00 19.50 20.00 20.50 21.00
to the other person.

In case the other person sends **DM 8.00**, this yields **DM 24.00.**
I return DM

?	?	?	?	?	?	?	?	?	?	?	?
0.00	0.50	1.00	1.50	2.00	2.50	3.00	3.50	4.00	4.50	5.00	5.50
?	?	?	?	?	?	?	?	?	?	?	?
6.00	6.50	7.00	7.50	8.00	8.50	9.00	9.50	10.00	10.50	11.00	11.50
?	?	?	?	?	?	?	?	?	?	?	?
12.00	12.50	13.00	13.50	14.00	14.50	15.00	15.50	16.00	16.50	17.00	17.50
?	?	?	?	?	?	?	?	?	?	?	?
18.00	18.50	19.00	19.50	20.00	20.50	21.00	21.50	22.00	22.50	23.00	23.50
?											
24.00											

to the other person.

In case the other person sends **DM 9.00**, this yields **DM 27.00.**
I return DM

?	?	?	?	?	?	?	?	?	?	?	?
0.00	0.50	1.00	1.50	2.00	2.50	3.00	3.50	4.00	4.50	5.00	5.50
?	?	?	?	?	?	?	?	?	?	?	?
6.00	6.50	7.00	7.50	8.00	8.50	9.00	9.50	10.00	10.50	11.00	11.50
?	?	?	?	?	?	?	?	?	?	?	?
12.00	12.50	13.00	13.50	14.00	14.50	15.00	15.50	16.00	16.50	17.00	17.50
?	?	?	?	?	?	?	?	?	?	?	?
18.00	18.50	19.00	19.50	20.00	20.50	21.00	21.50	22.00	22.50	23.00	23.50
?	?	?	?	?	?	?					
24.00	24.50	25.00	25.50	26.00	26.50	27.00					

to the other person.

In case the other person sends **DM 10.00**, this yields **DM 30.00.**
I return DM

?	?	?	?	?	?	?	?	?	?	?	?
0.00	0.50	1.00	1.50	2.00	2.50	3.00	3.50	4.00	4.50	5.00	5.50
?	?	?	?	?	?	?	?	?	?	?	?
6.00	6.50	7.00	7.50	8.00	8.50	9.00	9.50	10.00	10.50	11.00	11.50
?	?	?	?	?	?	?	?	?	?	?	?
12.00	12.50	13.00	13.50	14.00	14.50	15.00	15.50	16.00	16.50	17.00	17.50
?	?	?	?	?	?	?	?	?	?	?	?
18.00	18.50	19.00	19.50	20.00	20.50	21.00	21.50	22.00	22.50	23.00	23.50
?	?	?	?	?	?	?	?	?	?	?	?
24.00	24.50	25.00	25.50	26.00	26.50	27.00	27.50	28.00	28.50	29.00	29.50
?											
30.00											

to the other person.

[end of decision sheet]

Appendix B: Instructions Study 2

In the following, the instructions for study 2 are provided. The instructions are translated into English and are scaled down. Only instructions for player A and the condition with an endowment for both players are provided. The instructions for player B and the other condition are quite similar with slight changes only concerning the players perspective and the endowment. (The instructions for study 4 were similar to the one presented here with the only difference that the number of participants and the method how participants were paired together was different, and therefore corresponding changes to the instructions were made.)

[page 1]

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Please read through carefully the following instructions. In the following study, you will make decisions, and the decision consequences at least partly depend on the decision of the other participants of this study. You will each interact with another person. Only two persons are always paired together. The whole interaction takes place via computer. Neither during the experiment nor after the experiment will you be informed with which person you interacted– your decisions are anonymous.

Decisions
Now to the decisions. In the beginning, you will be paired with another person. One person is called "Decision maker 1" and makes the first decision. The second person is called "Decision maker 2" and makes a decision after Decision maker 1 has made a decision. You are Decision maker 1 during the whole study. First of all, both decision makers get an endowment of DM 10.

Decision maker 1 decides which amount, of the given endowment of DM 10, he or she wants to send to decision maker 2. The sent amount is then multiplied by 3. Subsequently, the second person, Decision maker 2, decides how much of the trebled amount he or she wants to return to Decision maker 1. Decision Maker 2 cannot send any portion of his or her endowment to Decision maker 1. Therewith the first period is finished.

Decision maker 1 receives as a payoff his or her endowment of DM 10 minus the amount sent and additionally the amount returned by Decision maker 2. Decision maker 2 gets as a payoff the endowment of DM 10 and additionally the trebled amount sent by Decision maker 1 minus the amount returned to Decision maker 1.

Examples
A) Suppose you send no amount, then you will receive your endowment of DM 10 and Decision maker 2 will also receive the endowment of DM 10.
B) Suppose you send an amount of DM 5. These DM 5 will then be trebled, yielding DM 15. Of these DM 15, Decision maker 2 can return any amount, maximal DM 15 return. If Decision maker 2, for example, returns DM 5, this results in a payment of DM 5 plus the DM 5 of the endowment, in total DM 10. Decision maker 2 receives the endowment of DM 10 plus the DM 10 kept of the trebled DM 15, altogether 20 DM.
C) If you send an amount of DM 10, this results in a trebled amount of DM 30. Of this DM 30, Decision maker 2 returns for example DM 20. Then you receive these DM 20 as payment. Decision maker 2 receives his or her endowment of 10 and the DM 10 kept, altogether DM 20.

[page 2]

Number of periods
After each period, another period follows with a probability of 87.5%. With a probability of 12.5%, noother period follows.
You can represent this random process like the following: Suppose 200 persons repeatedly take part in this experiment, thus resulting in 100 pairs. After all pairs have taken part in the first period, on average of around 88 pairs will be selected for another period, and around 12 pairs will be selected for whom no other period follows. After the second period of the 88 pairs, 87.5% are selected (around 77 pairs) again by chance for whom another period follows, and 12.5% of pairs are selected for whom no other period follows (around 11 pairs). On average after 7 periods, 45 pairs are still active and after 20 periods, 8 pairs of the originally 100 pairs will still be involved. The number of periods for a pair is therefore randomly determined and varies.
Please note that the probability of another period is independent of the period in which you are and is always 87.5%. Hence, it is equally probable that another period will follow whether you are in the second period or whether you are in the 20th period.

Pairs
If no other period follows, the pair ends. In this case a new pair is composed, so that you will interact with another participant and you start with the first period again as described above.
Altogether, you will take part in four pairs. Altogether, eight participants are present in the other rooms of the laboratory. Four of the participants take up the role of Decision maker 1 and four other participants take up the role of Decision maker 2. You will interact with all participants who are in the position of Decision maker 2, yielding four pairs.
You will only be paired with another person once and will never be paired with this person again.

[page 3]

Payoffs
In every period your payoff depends on the decisions you have made. The payoff per period will be summed up for you for all pairs.
From the total sum, you will be paid 3 percent as payment for participating in this study.
For example, if you reach a total payoff of DM 1000 you will get DM 30 as your payment.

Summary
In this study, you will interact with other participants via the computer. You will decide which amount of an endowment you will send to the other person. After each period, another period follows with a probability of 87.5%. If no other period follows, a new pair will be created. Altogether you will take part in four pairs.

The study starts with a learning pair. For this learning pair, a computer program takes up the role of Decision maker 2. The learning pair consists of 2 periods. In the first period, the computer program will return 100% of the sent amount. In the second period, the computer program will return 0% of the sent amount. The payoff obtained in the learning pair will not count and will not be paid to you.
Thanks a lot for your interest and for your participation. If you have any further questions, please return to any previous pages.

Here is a little question checking your understanding: Suppose you send an amount of DM 5 and Decision maker 2 returns DM 5. How much is now your total payoff, and how much is the total payoff for Decision maker 2 for this period?

[end of instructions]

Appendix C: Using a Genetic Algorithm for Building Simple Strategies

Finite automata were used as models for the participants, so that the automata replaced the participants. The automata have a maximum of four states and always an *initial state* in which the automata commence. Each state determines an output of multiples of 10 ranging from 0 to 100, representing the investment or return. Each automaton has an aspiration level of an integer value ranging from 34 to 100 (0 to 100 for player B), which categorizes the other player's decision as exploitation or reciprocity (trust or distrust). Depending on these categorized decisions, the automata move to different states. Given the sequential game structure, automata which represent player B make their decision after participants' decisions in the role of player A, therefore, they could have two initial states depending on player A's first decision. Note that if player A invests nothing, then player B cannot make any decision. Therefore, if player A makes no investment, automata representing participants' in the role of player B may move to another state, but the output (decision) of this state is not used as a prediction (only those periods are used for determining the fit in which player A made an investment so that player B could make a decision). Technically, each automaton is represented by a one-dimensional array with 14 elements (15 for player B). For a better interpretation of the automata only minimal automaton are reported (see Hopcroft & Ullman, 1979).

Two genetic algorithms are used. In the first one, finite automata were used to predict the behavior of participants in the role of player A, and the real decisions of the participants in the role of player B were used as input for the automata. In the second, genetic algorithm automata replaced participants in the role of player B, and the real decision of participants in the role of player A were used as input for the automata.

For the first generation, the genetic algorithm randomly generates an initial population of 60 pairs of automata. For each element of the arrays representing automata, a random number drawn from a uniform distribution of the corresponding interval is assigned. In each generation, each automaton is used to predict participants' decisions. Out of the pairs of automata, the automata that could predict a larger percentage of decisions for a participant are assigned to that participant. The fit of a pair of automata is defined as the average fit across the automata assigned to participants. Subsequently, pairs of automata are selected for the next generation via a *tournament selection* procedure (Goldberg, 1989). For this tournament, each pair of automata is combined subsequently with two different, randomly selected pairs of automata, and altogether 60 comparisons are

performed. In each comparison, the pair of automata with the greater fit is selected for the next generation. If two pairs of automata have the same fit, the pair with the lower number of states is selected. Subsequently, the selected automata are possibly mixed via a *two-point crossover* procedure, which occurs with a probability of 0.80. If a crossover takes place, the first two positions of the array representing automata are selected with equal probability. The elements of the array from the lower selected position to the higher selected position are interchanged between both automata. Subsequently, automata are eventually modified via a *mutation procedure*. For each element of the array, a mutation occurs with a probability of 0.01. If a mutation occurs for the automata's aspiration level or outputs, a new value is randomly drawn from a normal distribution with a mean of the original value, a standard deviation of 10 and with 0 and 100 as the borders of the distribution. The new values are rounded up to multiples of 10. If a mutation occurs for the states the automata possibly could move, the new values are drawn randomly from a uniform distribution of integers ranging from 1 to 4 representing the four states. The genetic algorithm is run for 3000 generations. To control random eventualities of a particular genetic algorithm for each player roles, five different runs of the genetic algorithm were determined. Out of these five runs, the pair of automata with the highest fit in predicting participants' decisions in the last 3000^{th} generation are selected as models of participants' behavior.