

SI APPENDIX

Focus on the success of others leads to selfish behavior

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CONTENTS

Supplementary figures	2
Interaction contexts	4
Experimental instructions	5
Example screens	8

Supplementary figures

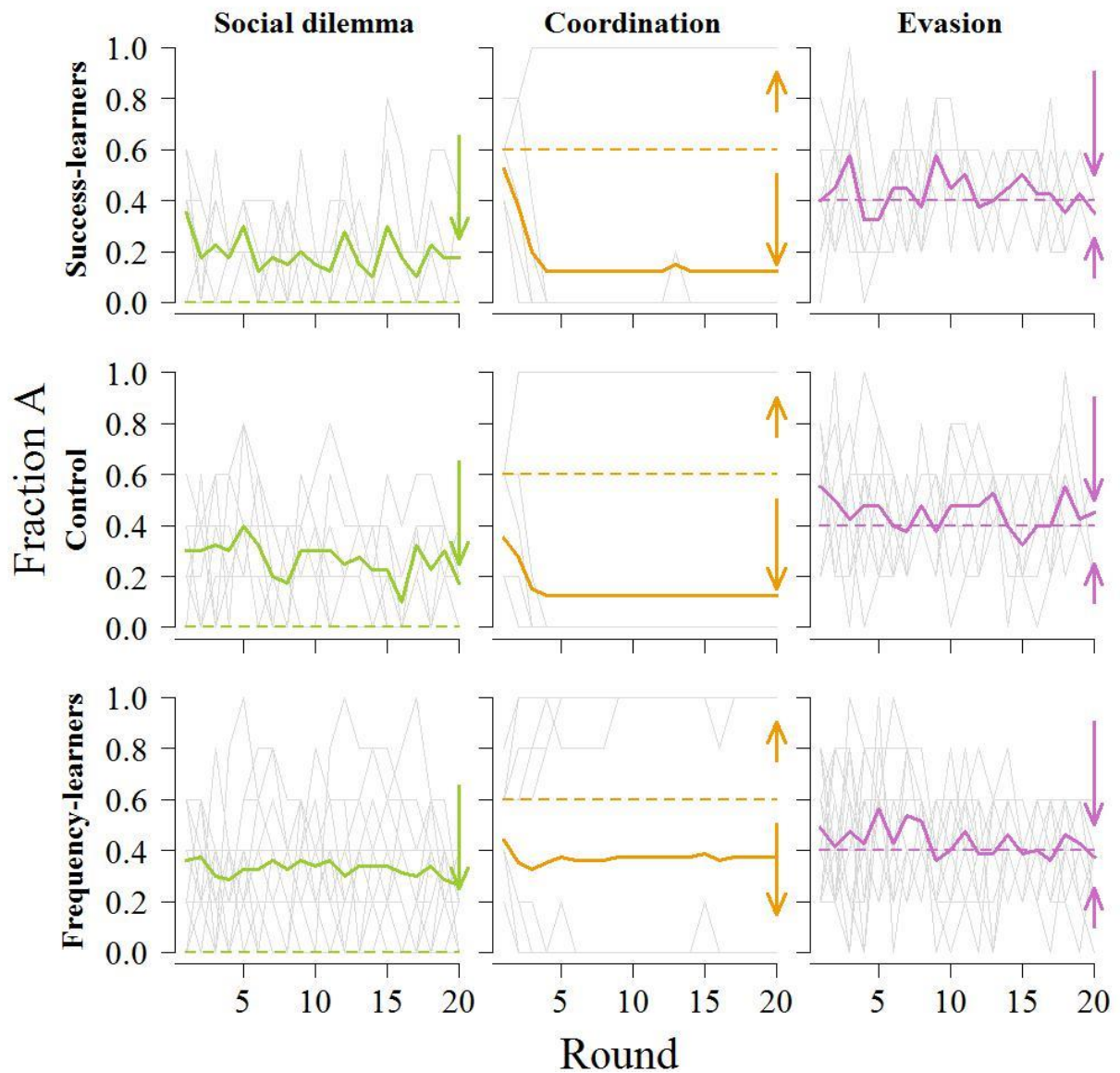


Fig. S1: Decisions over time in Part 2 of the experiment. Panels show the fraction of decisions that were made for option A in all social contexts, for all three types of assorted groups. Replicate groups are shown in grey (8 in the case of success-learners and control, 16 in the case of frequency-learners), colored lines show averages. In case of the social dilemma and the evasion game, the dotted line indicates the Nash-equilibrium of the one-shot version of the game; in case of the coordination game, it indicates the unstable internal equilibrium.

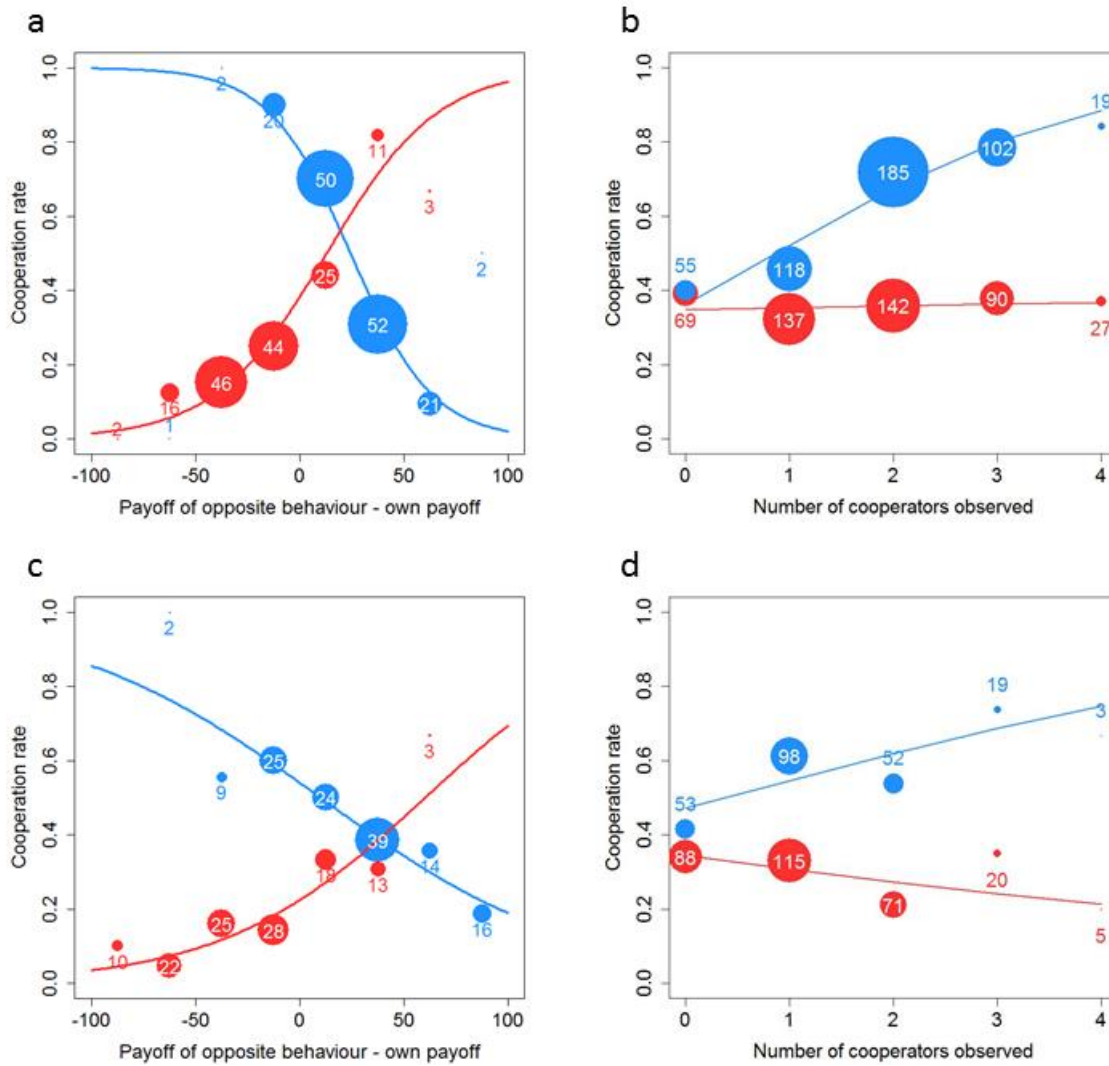


Figure S2: Non-pooled data for the response to social information. Both the top row and the bottom row correspond to Figure 3 from the main text, but contain only data from Part 1 and Part 2, respectively. Graphs show probability of cooperation after viewing success-information (a and c) and frequency-information (b and d).

Interaction contexts

The basic payoff structures of the contexts were the same between both parts, but the payoffs, noise on payoffs, and information cost in Part 2 were scaled with a factor 1.5 compared to Part 1 (here, values for Part 1 are given). In each interaction context, payoffs of choosing respectively A and B were given by $\pi_A = pa + (1-p)b + \varepsilon$ and $\pi_B = pc + (1-p)d + \varepsilon$, where p denotes the fraction of subjects in the group that chose option A , parameters a , b , c , and d determine the structure of the interaction context, and ε is a stochastic component, drawn from a normal distribution with mean 0 and standard deviation σ ($\sigma = 20$). The stochastic component reflects the fact that the outcome of behavior is often influenced by exogenous factors, and made it harder for the subjects to find out individually which choice was optimal, and as a consequence, made social information more valuable.

The four interaction contexts can be described as follows. In the non-social context, payoffs did not depend on the behavior of fellow group members ($a = b = 10$ and $c = d = 30$). In game theoretical terms, B dominates A in this situation, and $p^* = 0$ is the Nash equilibrium of the one-shot version of the ‘game’ (technically, it is not a game, since the payoffs do not depend on the actions of others). In the *social dilemma* context, cooperation (A) is dominated by defection (B): $a = 40 < c = 60$ and $b = -20 < d = 0$. Also in this case, there is a single Nash equilibrium at $p^* = 0$ - even though all subjects obtain a higher payoff at $p = 1$. This shows that in this context, collective interests and individual interests are opposed to each other, like in the famous (two-player) Prisoner’s Dilemma game. In the coordination game, the payoff of choosing one of the two options increased with the number of others also choosing it ($a = 50 > c = -30$ and $b = -30 < d = 90$). In this case, both $p^* = 0$ and $p^* = 1$ are Nash equilibria. However, the Nash equilibrium at $p^* = 0$ is Pareto superior; the payoff to all players is higher compared to the equilibrium at $p^* = 1$. There is a (dynamically unstable) equilibrium located at $p^* = (d - b) / (a - b - c + d) = 0.6$. In this equilibrium (in the experiment, when three subjects chose A and two subjects chose B), the expected payoffs of choosing A and choosing B were equal, but any deviation from this equilibrium leads towards either of the Nash equilibria. In the evasion game, the payoff of choosing one of the two options decreased with the number of others also choosing it ($a = -30 < c = 90$ and $b = 50 > d = -30$). In this case, there was a Nash equilibrium at $p^* = (d - b) / (a - b - c + d) = 0.4$ (when two subjects choose A and three choose B).

The reason for the different presentation of the decision context and differently scaled payoff matrices between Part 1 and Part 2 was to get a more robust measure of consistency. If we would have offered exactly the same games, subjects may only be consistent because they remember the exact same contexts from Part 1, and fall back on routine play.

Experimental instructions

Below are the general instructions to Part 1 and Part 2 of the experiment that the subjects received on paper, but were also read aloud by an experimenter.

General instructions for Part 1

Welcome!

This session will last for approximately 2 hours. During the session **it is not allowed to talk** or communicate with the other participants. If you have a question, please raise your hand and one of us will come to you to answer it. As indicated in the invitation, this session is **Part 1** of this study. You will also participate in Part 2, which is scheduled for April 2, 3, 4 and 5. At the end of this session, you will be able to indicate your availability for Part 2. On Friday March 15, we will send you an invitation for Part 2.

You will earn money in both Part 1 and Part 2 of this study. The amount you earn depends on your decisions and (sometimes) the decisions of others. The money you earn will be paid after Part 2. Please **stay seated at the end of the session** until your desk number is called. We will not inform any of the other participants about your earnings.

Setup

In the coming session you own an imaginary farm. You will run this farm in **4 different experiments** in which you can earn points. At the end of the session, these points will be translated into real money (100 points = 1 euro). At the beginning of each experiment, you will be grouped with 4 randomly chosen other participants in the room and each is randomly labelled with a number 1-5. All experiments are **anonymous**; you cannot find out the real identity of the other Farmers in your group, and they cannot find this out about you. During each experiment, your group consists of the same 5 participants, but when a new experiment starts, new groups are formed. The experiments are completely separate – what you earn in one experiment does not influence what you can earn in the other experiments. Also, it is likely that your earnings will vary between experiments.

Making decisions

Each experiment lasts for **20 Seasons**. In each Season, you will make a decision how to use the land on your farm. In each experiment, you will decide between two different Crops. All Farmers in your group will make this decision at the same time.

Once all Farmers have made their decision, all Crops of all Farmers in your group are sold on the Market. This procedure is automated in the computer program. The number of points you earn (your ‘revenue’) depends on three things:

1. **Crop value:** one of the two Crops is worth more points. This Crop yields higher revenues on the Market.
2. **Your land production:** the number of Crops you produce in a Season is affected by things that you don’t control, such as crop diseases or pests. In each Season, Farmers that make the same decision, will not receive exactly the same revenues. It will sometimes occur that a Farmer that chose the Crop with the higher value, will nevertheless get less revenues than a Farmer that chose the Crop with the lower value. However, on average, the Crop with the higher value will give higher revenues. The variation in Crop production is fully determined by chance.
3. **Decisions of other Farmers:** in experiment 1, your revenues are independent of the decisions of the other Farmers in your group. In experiments 2, 3 and 4, your revenues **also** depend on the decisions of other Farmers. *How* your revenues depend on your decisions and the decisions of the other Farmers in your group, is given by the ‘Market Rules’. These Rules are different in each of the experiments. The Market Rules will always be explained by the computer program at the beginning of each experiment. During an experiment, the Market Rules remain the same. Before the Seasons of an experiment start, you will fill out a short Quiz to check if you understand the Market Rules.

At the end of each Season, you are informed about the number of points you received for your Crops. It is also possible to lose points. The points you earn are stored in the computer memory.

Collecting information

Before making your decision, you can **collect information** about the decisions and revenues of the Farmers in your group. Two kinds of information are available about each Farmer:

- i) Decision in the previous Season
- ii) Revenue in the previous Season

At the start of each Season, you can indicate whether or not you want to collect information. Collecting information costs **2 points**. For those 2 points, you can collect up to 4 pieces of information in total. Collecting information about the decisions and revenues of other Farmers can be useful in finding out which Crops the other Farmers are producing, and which Crop has the higher value.

If you indicated not to collect information, no costs will be charged. In the first Season of each experiment, no information is available yet. At the start of the session, a **test trial** will make you familiar with the decision making environment on the computer screen. This test trial lasts for 5 Seasons. You cannot earn anything; the points are not worth any money. After the test trial, the experiments will start.

Time limits

In each Season (except the first of each experiment), you have **10 seconds** to decide if you want to collect information about the Farmers in your group. If you have not decided within this time period, you will not get the opportunity to collect information. If you indicated 'Yes' (and confirmed), you have **20 seconds** to decide which pieces of information you wish to collect. In the Decision screen the information you collected is shown to you, and you can make your decision how to use your land. You have **20 seconds** to make this decision. If you have not decided (and confirmed your decision) within this time period, the computer program will make a random choice for you. When the Season has finished, a Results screen shows you the number of points you earned in this Season. This screen is shown to you for **10 seconds**. After the Results screen, a new Season will start.

After 20 Seasons, the experiment is over, and a new experiment will be started by us. At the beginning of this new experiment, you will again be grouped with 4 randomly chosen other participants in the room and each participant is randomly labeled with a number 1-5, and the new Market Rules are explained in the computer program. After 4 experiments, the session ends.

End of the session

At the end of the series of 4 experiments, you are asked to fill out a Questionnaire. In this Questionnaire, you can also indicate your availability for Part 2. As indicated in the invitation for this experiment, you must be available for at least for blocks of Part 2. However, we encourage you to indicate availability for more than four blocks – there will be a (monetary) bonus for each extra block you are available for. Please stay seated after you finished the Questionnaire until we call your desk number.

General instructions for Part 2

Welcome!

This session will last for approximately 2 hours. During the session **it is not allowed to talk** or communicate with the other participants. If you have a question, please raise your hand and one of us will come to you to answer it. As you know, this is **Part 2** of this study. As in Part 1, you will earn money in this Part, and the amount you earn depends on your decisions and (sometimes) the decisions of others. Your total earnings will be paid to you in cash at the end of this session. We will not inform any of the other participants about your earnings. Please **stay seated at the end of this session** until your desk number is called.

Setup

In the coming session you will be making Investment decisions as a Trader on an imaginary stock market. You will be making Investments in **4 different experiments** in which you can earn points. At the end of the study, these points will be translated into real money (100 points = 1 euro). At the beginning of each experiment, you will be grouped with 4 randomly chosen other participants in the room, and each is randomly labelled with a number 1-5. All experiments are **anonymous**; you cannot find out the real identity of the other Traders in your group, and they cannot find this out about you. During each experiment, your group consists of the same 5 participants, but when a new experiment starts, new groups are formed. The experiments are completely separate – what you earn in one experiment does not influence what you can earn in the other experiments. Also, it is likely that your earnings will vary between experiments.

Making decisions

Each experiment lasts for **20 Trading Periods**. In each Trading Period, you will make an Investment decision. You will always decide to invest in one of two different Companies. All Traders in your group will do their Investment at the same time.

Once all Traders have done their Investment, the Profit of all Traders is calculated. This procedure is automated in the computer program. The number of points you earn (your Profit) depends on three things:

1. **Company performance:** one of the two Companies is performing better than the other. Investing in this Company leads to higher Profits. During an experiment, it is always the same Company that performs the best.
2. **Market fluctuations:** the Profit you make is influenced by fluctuations of the market that you don't control. Because the stocks of different Traders are not sold at exactly the same moment, Traders that invest in the same Company will not make the same Profit. It can happen that a Trader that chose to invest in the better-performing Company, will nevertheless make less Profit than a Trader that chose to invest in the worse-performing Company. However, on average, Traders investing in the Company that performs better will make more Profit. The market fluctuations are completely determined by chance.
3. **Decisions of other Traders:** in the first experiment, your Profit is independent of the Investments of the other Traders in your group. In the other three experiments, your Profit **also** depends on the Investments of other Traders. *How* your Profit depends on your Investment decision and the Investments of the other Traders in your group, is given by the 'Market Rules'. These Rules are different in each of the experiments. The Market Rules will always be explained by the computer program at the beginning of each experiment. During an experiment, the Market Rules remain the same. Before the Trading Periods of an experiment start, you will fill out a short Quiz to check if you understand the Market Rules.

At the end of each Trading Period, you are informed about the number of points you received (your Profit). It is also possible to lose points. The points you earn are stored in the computer memory.

Collecting information

Before making your Investment decision, you can **collect information** about the Investments and Profits of the Traders in your group. Two kinds of information are available about each Trader:

- i) Investment decision in the previous Trading Period
- ii) Profit in the previous Trading Period

At the start of each Trading Period, you can indicate whether or not you want to collect information. Collecting information costs **3 points**. For those 3 points, you can collect up to 4 pieces of information in total. Collecting information about the Investments and Profits of other Traders can be useful in finding out which Company the other Traders are investing in, and which Company is performing better.

If you indicated not to collect information, no costs will be charged. In the first Trading Period of each experiment, no information is available yet. At the start of the session, a **test trial** will make you familiar with the decision making environment on the computer screen. This test trial lasts for 5 Trading Periods. You cannot earn anything in the test trial; the points are not worth any money. After the test trial, the real experiments will start.

Time limits

In each Trading Period (except the first of each experiment), you have **10 seconds** to decide if you want to collect information about the Traders in your group. If you have not decided within this time period, you will not get the opportunity to collect information. If you indicated 'Yes' (and clicked the 'confirm' button), you have **20 seconds** to decide which pieces of information you wish to collect. In the Investment screen the information you collected is shown to you, and you can make your Investment decision. You have **20 seconds** to make this decision. If you have not decided (and clicked the 'confirm' button) within this time period, the computer program will make a random choice for you. When the Trading Period has finished, a Results screen shows you the Profit you made this Trading Period. This screen is shown to you for **10 seconds**. After the Results screen, a new Trading Period will start.

After 20 Trading Periods, the experiment is over, and a new experiment will be started by us. At the beginning of this new experiment, you will again be grouped with 4 randomly chosen other participants in the room and each participant is randomly labelled with a number 1-5. Also, the new Market Rules are explained in the computer program. After 4 experiments, we will start a short extra Stage in which you will make only one decision. Instructions for this stage will be given on the computer screen.

Example screens

Specific instructions for the social dilemma game in Part 1

A new experiment starts now.
You are grouped with 4 randomly chosen other participants.

Market Rules:
In this experiment, Apples are the only Crop available.

Each Season, you can decide if you want to **spray Pesticides** during the production of your Apples.
Using Pesticides will increase your land production.
However, the **more** Farmers decide to use Pesticides,
the **lower** the value of **all Apples** on the Market (both Sprayed Apples and Unsprayed Apples).

Before the Seasons of this experiment start,
a short Quiz will check if you understood the Market Rules.
Please click below when you are ready!

Continue

Specific instructions for the social dilemma game in Part 2

A new experiment starts now.
You are grouped with 4 randomly chosen other participants.

Market Rules:
In this experiment, there are two Companies: **HighTech** and **LowTech**.

Both Companies produce Tablet PCs. However, HighTech produces Tablets of high quality,
and LowTech produces Tablets of low quality. LowTech can produce their low-quality Tablets more
cheaply, so LowTech performs better in the market. In principle, this means that **investing in LowTech**
leads to higher profits than investing in HighTech.

However, the more low-quality Tablets are produced, the fewer Tablets are sold in total, and the worse both
Companies perform. This means that **the more Traders invest in LowTech, the lower the Profits of**
both LowTech and HighTech will be.

Before the Trading Periods of this experiment start,
a short Quiz will check if you understood the Market Rules.
Please click below when you are ready!

Continue

Quiz for the social dilemma in Part 1

Quiz

1. New groups have been formed randomly.
 true
 false

2. In each Season of this experiment, I can decide to use Pesticides to produce my Apples.
 true
 false

3. The value of all Apples is higher when I choose to use Pesticides.
 true
 false

4. The value of all Apples is highest, if all Farmers produce their Apples without using Pesticides.
 true
 false

OK

Information collection screen 1

Season3 out of 20Remaining Time 13

Collect up to 4 pieces of information! Update Information!

Farmer 1		Farmer 3	Farmer 4	Farmer 5
Previous decision <input type="radio"/>		Previous decision <input type="radio"/>	Previous decision <input type="radio"/>	Previous decision <input type="radio"/>
Previous revenue <input type="radio"/>		Previous revenue <input type="radio"/>	Previous revenue <input type="radio"/>	Previous revenue <input type="radio"/>

You are Farmer 2

Previous decision

Previous revenue

Information collection screen 2

Season		3 out of 20		Remaining Time		4				
Collected information is shown below. Make your decision!										
Farmer 1				Farmer 3		Farmer 4		Farmer 5		
Previous decision	Sprayed			Previous decision	Sprayed	Previous decision	Unsprayed	Previous decision		
Previous revenue	36			Previous revenue		Previous revenue		Previous revenue		
You are Farmer 2										
Previous decision		Which Crop do you want to produce in this Season?					<input checked="" type="radio"/> Sprayed <input type="radio"/> Unsprayed			
Previous revenue									Confirm	

Results screen

Season		2 out of 20		Remaining Time		8	
Results from this Season							
<p>You produced Sprayed Apples. Your revenue: 36 points.</p> <p>You did request information. Costs: 2 points.</p> <p>Points earned in this Season: $36 - 2 =$ 34</p>							