



Instructor Guide to the Prisoner's Dilemma Games

Laboratory implementation, theoretical foundations,
experimental evidence, and variants

Behavioral and Experimental Economics Research Lab
Department of Economics



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<https://beer-lab.org/>

How to use this guide

This guide supports the preparation, delivery, and classroom discussion of the Prisoner's Dilemma game family developed for the Behavioral and Experimental Economics Research Lab (BEER Lab) in the Department of Economics at Tecnológico de Monterrey. It is intended for instructors with different levels of experience in experimental economics and game theory.

The **quick guide** is sufficient to launch a session. The operational chapters explain each screen.

The conceptual chapters connect theory, predictions, and evidence to classroom feedback. Common instructions appear once; each variant describes only what changes relative to the basic game.

Author

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For the instructor

This guide corresponds to the English interface. A separate Spanish version is available. Project aggregate results only: do not connect codes with names, student IDs, seats, or individual decisions.

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Quick implementation guide

1.1 Access through the updated laboratory website

Start at <https://beer-lab.org/en/>. Select **CLASSROOM** in the top navigation menu; it opens <https://teaching.beer-lab.org/en/>. In the **Classroom experiments** catalog, use the search box to locate the activity by name. You can also filter by **Topic** or **JEL code**. Clear any filters left from an earlier search before looking for another game.

Each family's card distinguishes **Español** and **English** access links. The **Show extended version** checkbox selects that edition before following a link. Catalog language and session language are separate choices: verify both. Students use the room specified by the instructor; the instructor prepares and monitors the session through this family's own administrative pages.



Figure 1.1: Current institutional website. Select CLASSROOM in the top navigation menu to open the teaching experiments. Captured on October 7, 2026.

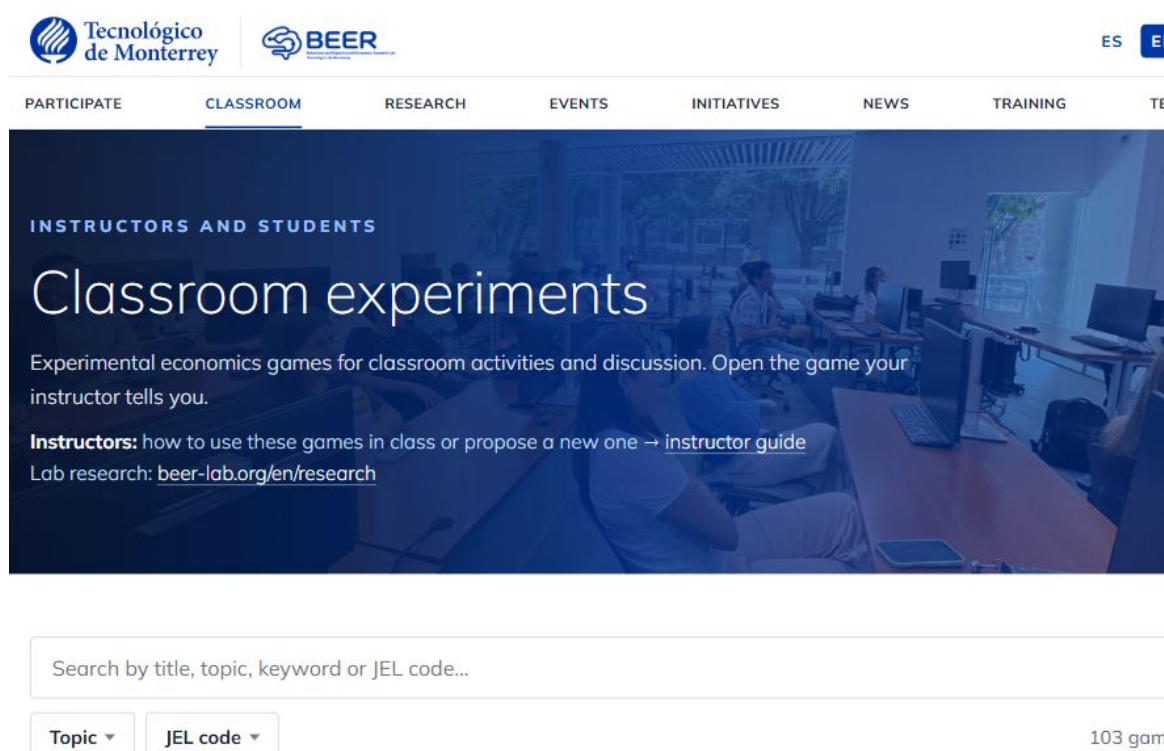


Figure 1.2: Current catalog: search by title, topic, or JEL code. Then locate this family's card and select language and edition. Captured on October 7, 2026.

Checking resources, comprehension, and participant requirements

Before opening the room, check the selected configuration and the number of students present. The session-creation form states the group size and minimum required by that configuration. An individual activity accepts any positive participant count; an interactive activity must satisfy its stated requirement: complete groups when size is fixed, or a minimum participant count when size is flexible. Requirements may change across treatments, for example when adding a third party or changing an institution's size. If you edit a grouping parameter, check the requirement for the edited configuration, rather than relying only on the demo's suggested count.

In the instructions, ensure that students can identify what each role receives, what they can decide, and how the outcome is calculated. An initial account, a distributable budget, and final earnings need not be the same amount. Refer to the resources panel and the example for the selected treatment. Do not carry the basic edition's endowment into a treatment that changes accounts or introduces additional positions.

ECU stands for *Experimental Currency Units*: the activity's unit of account. An outcome of 100 ECU does not automatically equal 100 pesos or 100 dollars. Conversion depends on the session configuration. Before announcing a payment, confirm with the laboratory whether money is paid, the conversion rate, and which decisions count for payment. In hypothetical modules, describe amounts as outcomes in the stated situation.

When a comprehension check is included, an incorrect response receives an explanation beside that question, identifying the submitted answer and the correct answer. Other answers remain in the form. Ask the student to return to the example, locate the relevant rule, and redo the calculation before correcting the response. Avoid revealing answers to the entire class for an individual error, and do not interpret a comprehension mistake as an economic choice in the game.

Prisionero extendido — versión básica, una ronda	Dilema del prisionero / Prisoner's Dilemma — BEER Lab Seleccione una variante de este juego. Select a version of this game.
Prisionero extendido — versión básica, 10 rondas, pareja fija	
Prisionero extendido — versión básica, 10 rondas, parejas aleatorias	
Prisionero extendido — comunicación estructurada	
Prisionero extendido — decisiones secuenciales	
Prisionero extendido — método de estrategia	
Prisionero extendido — tentación alta	
Prisionero extendido — horizonte incierto	
Prisionero extendido — error de implementación	
Prisionero extendido — castigo costoso entre pares	
Prisionero extendido — información social	
Prisionero extendido — decisiones observables	
Prisionero extendido — marco comunitario	
Prisoner's Dilemma — baseline, one round	
Prisoner's Dilemma — baseline, 10 rounds, fixed partner	
Prisoner's Dilemma — baseline, 10 rounds, random partners	
Prisoner's Dilemma — structured communication	
Prisoner's Dilemma — sequential decisions	
Prisoner's Dilemma — strategy method	
Prisoner's Dilemma — higher temptation	
Prisoner's Dilemma — indefinite horizon	
Prisoner's Dilemma — implementation error	
Prisoner's Dilemma — costly peer punishment	
Prisoner's Dilemma — social information	
Prisoner's Dilemma — observable decisions	
Prisoner's Dilemma — community frame	
Prisionero — una ronda	
Prisionero — 10 rondas, pareja fija	
Prisionero — 10 rondas, parejas aleatorias	
Prisoner's Dilemma — one round	
Prisoner's Dilemma — 10 rounds, fixed partner	

Figure 1.3: Demo contains only the configurations of this game family, in both languages and editions. Continuation 1/3.

Prisionero extendido — marco comunitario
Prisoner's Dilemma — baseline, one round
BE
Prisoner's Dilemma — baseline, 10 rounds, fixed partner
Prisoner's Dilemma — baseline, 10 rounds, random partners
Prisoner's Dilemma — structured communication
Prisoner's Dilemma — sequential decisions
Prisoner's Dilemma — strategy method
Prisoner's Dilemma — higher temptation
Prisoner's Dilemma — indefinite horizon
Prisoner's Dilemma — implementation error
Prisoner's Dilemma — costly peer punishment
Prisoner's Dilemma — social information
Prisoner's Dilemma — observable decisions
Prisoner's Dilemma — community frame
Prisionero — una ronda
Prisionero — 10 rondas, pareja fija
Prisionero — 10 rondas, parejas aleatorias
Dilemma — one round
Dilemma — 10 rounds, fixed partner
Dilemma — 10 rounds, random partners
Compliance — Una ronda
Compliance — Diez rondas, pareja fija
Compliance — Diez rondas, parejas reasignadas
Compliance — Intenciones no vinculantes
Compliance — Error de implementación: 10%
Compliance — Observación privada imperfecta: 10%
Compliance — Observación privada imperfecta: 25%
Compliance — Continuación de 75%, máximo diez
Compliance — Continuación de 50%, máximo diez
Compliance — Reputación portátil con reasignación
Compliance — Descuento automático seguro 12
Compliance — Descuento de 12 con probabilidad 50%
Compliance — Depósito fijo financiado: 10
Compliance — Depósito elegido y observable: 0–10
Compliance — Tentación alta: 45
Compliance — Respuesta costosa entre pares
Compliance — One round
Compliance — Ten rounds, fixed partner
Compliance — Ten rounds, reassigned partners
Compliance — Nonbinding intentions

Figure 1.4. Demo contains only the configurations of this game family, in both languages and editions. Continuation 2/3.

	y cumplimiento — Observación privada imperfecta: 25%
BE	y cumplimiento — Continuación de 75%, máximo diez
	y cumplimiento — Continuación de 50%, máximo diez
	y cumplimiento — Reputación portátil con reasignación
	y cumplimiento — Descuento automático seguro: 12
	y cumplimiento — Descuento de 12 con probabilidad 50%
	y cumplimiento — Depósito fijo financiado: 10
	y cumplimiento — Depósito elegido y observable: 0–10
	y cumplimiento — Tentación alta: 45
	y cumplimiento — Respuesta costosa entre pares
	and compliance — One round
	and compliance — Ten rounds, fixed partner
	and compliance — Ten rounds, reassigned partners
	and compliance — Nonbinding intentions
	and compliance — Implementation error: 10%
	and compliance — Imperfect private observation: 10%
	and compliance — Imperfect private observation: 25%
	and compliance — 75% continuation, maximum ten
	and compliance — 50% continuation, maximum ten
	and compliance — Portable reputation with reassignment
	and compliance — Certain automatic deduction: 12
	and compliance — 12 deduction with 50% probability
	and compliance — Funded fixed deposit: 10
	and compliance — Chosen and observable deposit: 0–10
	and compliance — High temptation: 45
	and compliance — Costly peer response

Figure 1.5: Demo contains only the configurations of this game family, in both languages and editions. Continuation 3/3.

Rooms

Current rooms:

[ES] Dilema del prisionero
[EN] Prisoner's Dilemma
[ES] Dilema del prisionero extendido
[EN] Extended Prisoner's Dilemma

Figure 1.6: Rooms contains the four rooms for this family: basic and extended editions in Spanish and English.

Room: [EN] Prisoner's Dilemma

Create a new session

English room. Only the three English configurations for this game are shown below.

Session Config

[EN] Prisoner's Dilemma — one round

Number of participants

Complete groups of 2 participants. Use a multiple of 2; minimum 2.

Create

[Configure session](#) 

App sequence

prisoners_dilemma_game (10 rounds)

Dilema del prisionero bilingüe / Bilingual Prisoner's Dilemma.

Figure 1.7: Session-creation form for the basic English room. Check the selected configuration and participant requirement before creating the session.

Downloading a session with several rounds

For the instructor

Open **Data** within the relevant session and use that session's CSV or CSV-for-Excel download link. The general export has one row per participant and columns for the different rounds. Ten rounds do not necessarily mean ten rows per person. When the family provides its own long-format export, observations may instead be organized by participant and round or another unit defined by the design.

Save the original file together with the configuration name, session code, and active-round count. Check that columns for the last active round are present and that the data belong to the selected session. Empty cells can represent inactive rounds, a pending decision, or a field that does not apply to a role; do not automatically recode them as zeros. To compare learning, preserve round and group identifiers alongside participant identifiers. Share only anonymous aggregates in class, and record session incidents before constructing derived tables.

1.2 At a glance

Purpose	Study the tension between the individual incentive to defect and the efficiency of mutual cooperation.
Payoff	Baseline matrix: 60–60 if both cooperate; 100–0 if only one defects; 20–20 if both defect.
Participants	An even number; groups of two. In the basic game, decisions are simultaneous.

Time	25–35 minutes for one round; 45–60 for ten rounds or an extended variant.
Student access	.../room/prisoners_dilemma_en .
Extended access	.../room/prisoners_dilemma_extended .
Instructor access	prisoners.beer-lab.org/demo .
Report	Individual cooperation, pair outcomes, mean payoff, and trends; treatment-specific indicators in extended variants.
Experimental unit	Interactions in groups of 2 participants.
Basic edition	one round; 10 rounds, fixed partner; 10 rounds, random partners; One round; Ten rounds, fixed partner; Ten rounds, reassigned partners.
Extended edition	baseline, one round; structured communication; sequential decisions; strategy method; higher temptation; indefinite horizon; implementation error; costly peer punishment; social information; observable decisions; community frame; Imperfect private observation: 10%; Portable reputation with reassignment; Certain automatic deduction: 12; Funded fixed deposit: 10; Chosen and observable deposit: 0–10.
Decision	Each participant chooses whether to cooperate without observing their partner's simultaneous choice.
Topics	social dilemmas; repeated games; international cooperation; imperfect observation; reputation; agreement compliance.
JEL	C72; C73; C91; C92; D91; F53.

1.3 Minimum sequence

1. Confirm an even participant count and choose treatment, rounds, and matching.
2. Open [beer-lab.org](#), choose **View games**, and continue to [teaching.beer-lab.org](#).
3. Select the **Prisoner's Dilemma** card and language.
4. From the instructor route, open **Rooms** and then the basic or extended room.
5. Choose the configuration, create the session, and open **Monitor** and **Report**.
6. Share the room or QR code. Reveal the report only after everyone completes the round.

1.4 Checklist

- ☐ Computers, internet, browser, and projector are ready.
- ☐ Even participant count, variant, rounds, and matching are confirmed.
- ☐ Credentials, link, or QR code were tested on another device.
- ☐ Teaching-only status or payment rule was stated before the session.
- ☐ Monitor, report, and discussion prompts are ready.

Accessing the platform

2.1 Route from the laboratory website

At beer-lab.org, select **View games** under **Instructors and students**.

The catalogue is located at teaching.beer-lab.org. Select the Prisoner's Dilemma card and the session language.

2.2 Student and instructor routes

	Students	Instructor
Route	/room/prisoners_dilemma_en	/demo
Use	Join the session	Create and supervise
Identification	Anonymous code	Administrative credentials
Projection	No	Aggregate report only

What participants will see

Students do not need an oTree, GitHub, or ORSEE account. They open the room, join the session, and receive an anonymous code.

2.3 Creating and monitoring a session

Under **Rooms**, open the room and select the configuration and participant count. Use the persistent room in class and **Demo** for testing. At the address for this game, **Demo** lists only the 64 prisoner's dilemma configurations, and **Rooms** shows only its four rooms (basic and extended in Spanish and English). If another game appears, do not start the session; contact the laboratory coordinator.

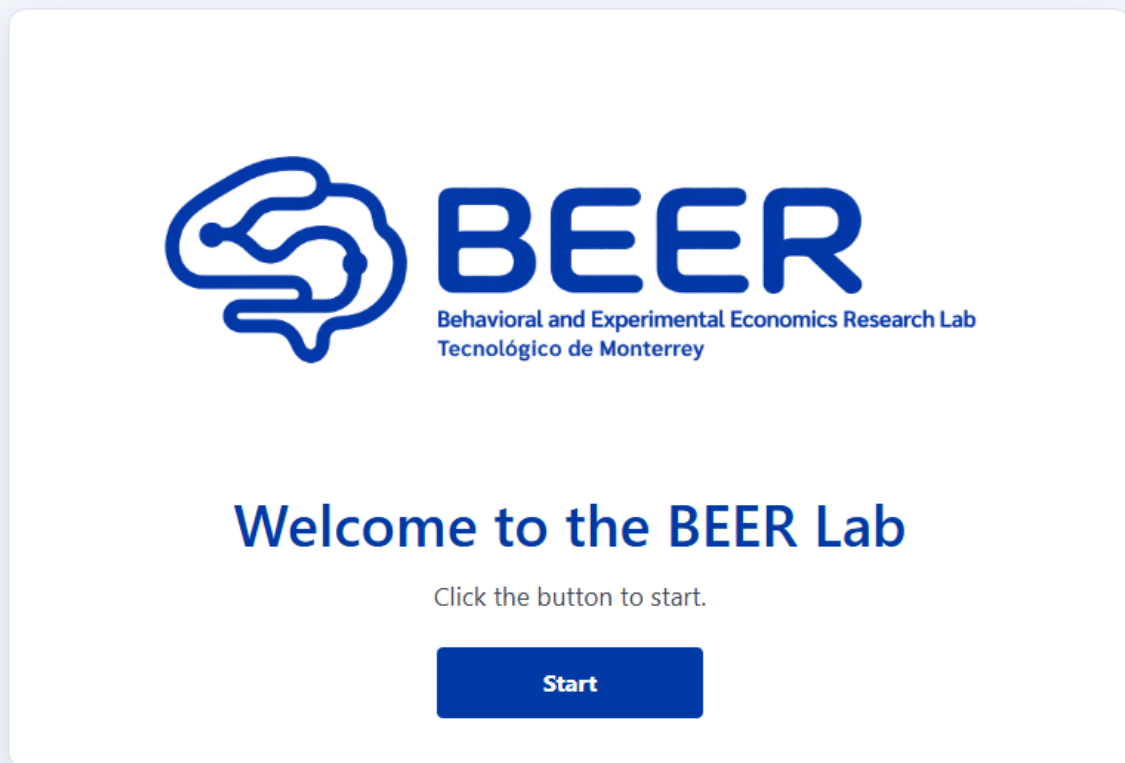


Figure 2.1: Two routes with different functions. Student room.

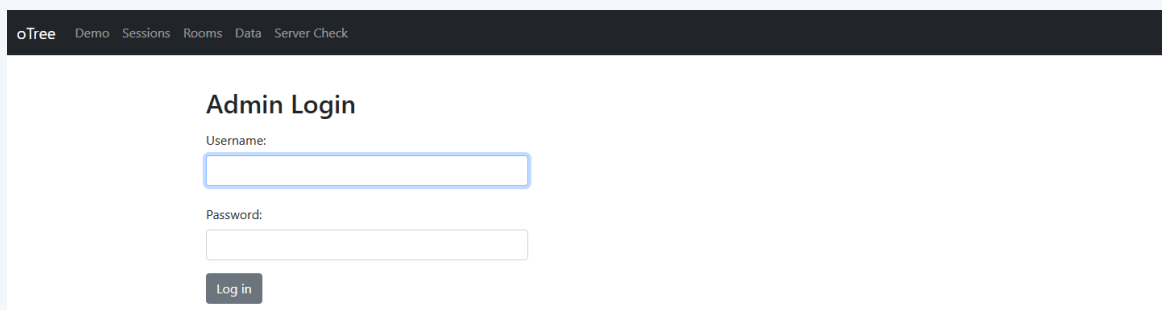
The image shows an administrative login interface. At the top, there is a dark navigation bar with the "oTree" logo and links for "Demo", "Sessions", "Rooms", "Data", and "Server Check". Below the navigation bar, the title "Admin Login" is centered. Underneath the title, there are two input fields: "Username:" followed by a text input box, and "Password:" followed by a password input box. At the bottom of the form, there is a "Log in" button.

Figure 2.2: Administrative sign-in.

oTree

[Demo](#)[Sessions](#)[Rooms](#)[Data](#)[Server Check](#)

[EN] Prisoner's Dilemma — one round: session 'p32zbtas' (demo)

[New](#)[Links](#)[Monitor](#)[Data](#)[Payments](#)[Report](#)[Description](#)

Below are temporary links for testing and demonstration. To launch a real study, either create persistent links by setting up a [room](#), or create a session through the [sessions page](#).

Choose one of the following options to play the session:

Combined views

Split-screen view

Launch

Grid view

Launch

Session-wide testing link

Open the below link in up to 4 browser tabs.

<http://127.0.0.1:8001/join/pigasogi>

Single-use links

Open each link in its own browser tab.

P1	http://127.0.0.1:8001/initializeParticipant/1wvbtvm0
P2	http://127.0.0.1:8001/initializeParticipant/14aln2qv
P3	http://127.0.0.1:8001/initializeParticipant/2ui0y9w0
P4	http://127.0.0.1:8001/initializeParticipant/v60vb0wx

Figure 2.3: Creating and monitoring a session. Temporary testing links.

oTree

[Demo](#)[Sessions](#)[Rooms](#)[Data](#)[Server Check](#)

[EN] Prisoner's Dilemma — one round: session 'p32zbtas' (demo)

[New](#)[Links](#)[Monitor](#)[Data](#)[Payments](#)[Report](#)[Description](#)

ID	Code	Label	Progress	App	Round	PageName	Waiting	WaitsFor	Since	
0 started, 0 in progress (total: 4)										

Advance slowest participants

Figure 2.4: Participant progress.

Elements common to all versions

3.1 Rules and payoff matrix

Each participant chooses **Cooperate** (C) or **Defect** (D). In the basic game, both decide without observing their partner's decision.

		Player B	
		Cooperate	Defect
Player A	Cooperate	(60,60)	(0,100)
	Defect	(100,0)	(20,20)

The payoffs satisfy $T = 100 > R = 60 > P = 20 > S = 0$ and $2R > T + S$. Defection therefore strictly dominates cooperation for a participant who maximizes only their monetary payoff, even though mutual cooperation yields the largest joint outcome.

For the instructor

Use the matrix before revealing results. Ask the class to separate two questions: “What is individually optimal for either action by the partner?” and “Which outcome maximizes total payoffs?”

3.2 Cover, instructions, and comprehension

The comprehension check covers all four payoffs in the matrix, simultaneity, rounds, and matching. It explains errors and allows another attempt.

3.3 Preparation, decision, and wait

The wait page synchronizes the pair. “Please wait” is expected when the partner has not yet decided.



Welcome to the BEER Lab

The **Behavioral and Experimental Economics Research Lab** at the Department of Economics of Tecnológico de Monterrey is a space for learning about economic decision-making through controlled activities.

Read each screen carefully and make your decisions independently. Results will be presented in aggregate for class discussion.

Laboratory rules

- Remain quiet and do not speak with other participants.
- Do not look at other screens.
- Put away your phone.
- Do not close, refresh, or leave this page.
- If you need help, raise your hand.
- When you finish, wait for your instructor's directions.

☐ I have read and understood the laboratory rules.

Continue to instructions

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Figure 3.1: Entry and instructions. BEER Lab rules.

Prisoner's Dilemma

BEER Lab · Tecnológico de Monterrey

Baseline

One round · One random pair

Each person chooses between **Cooperate** and **Defect**. The outcome depends on both decisions.

Your decision	Other person: Cooperate	Other person: Defect
Cooperate	60, 60 You: 60 · Other: 60	0, 100 You: 0 · Other: 100
Defect	100, 0 You: 100 · Other: 0	20, 20 You: 20 · Other: 20

Continue

Powered by [oTree](#)

Figure 3.2: Current basic-edition instructions, with initial resources and experimental units.

3.4 Outcome and individual summary

The outcome page displays both choices, the round payoff, the joint outcome, and, when relevant, the cumulative payoff. The final summary provides the participant's own history.

3.5 Instructor report

The report stays hidden until the instructor reveals it, preventing partial results from affecting students who are still deciding. The basic report shows the cooperation rate over individual decisions; mutual cooperation and mutual defection over pairs; mean payoff; the distribution of all three pair outcomes; and, in repeated sessions, cooperation by round.

Attention

The cooperation rate uses individual decisions, while the outcome distribution uses pairs. Always report both denominators. With two pairs, for example, one observation represents 50% of the distribution.



Check the rules

Review the marked questions. Each shows your answer and an explanation; your other answers are retained.



In the matrix, what does each person receive if both choose A?

31

Your answer: 31. The correct answer is 30. Review the rules and complete a valid answer in each field.

In the matrix, what do you receive if you choose B and the partner A?

40

When are actual payoffs displayed?

☐ After every round

☒ Only on the final screen

Continue

Con tecnología de [oTree](#)

Figure 3.3: Current comprehension check with an incorrect answer, its specific explanation, and retained responses.

Before starting

Your position is B.

Baseline

One random pair

Positions A and B are equivalent and only organize the pair.

Begin

Powered by [oTree](#)

Figure 3.4: Preparation and decision. Mechanism confirmation.

Your decision

Round 1 of 1

Baseline
One random pair

Your decision	Other: Cooperate	Other: Defect
Cooperate	60, 60	0, 100
Defect	100, 0	20, 20

☐ Cooperate

☐ Defect

Confirm decision

Powered by [oTree](#)

Figure 3.5: Private choice.

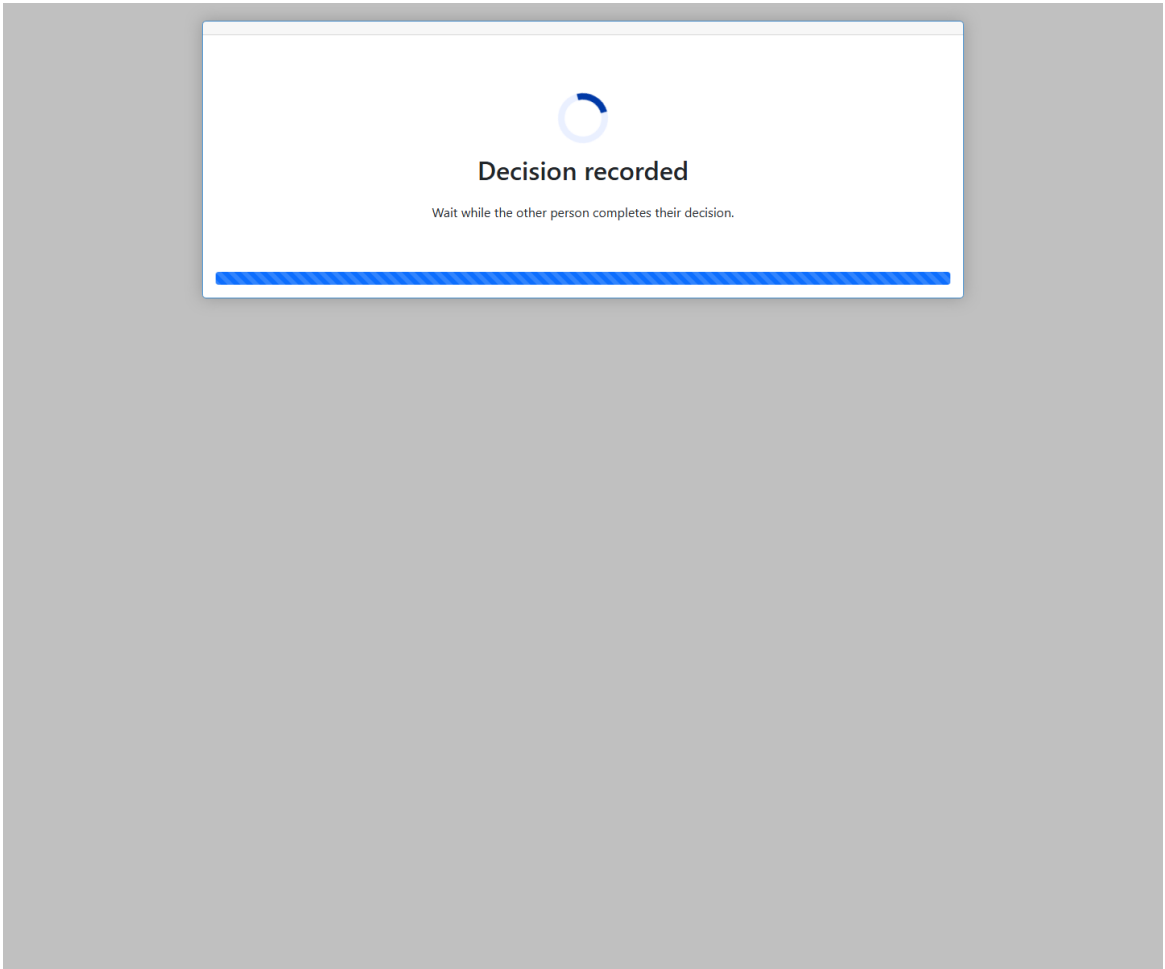


Figure 3.6: Waiting for the partner's decision.

Round 1

The decisions were recorded.

Baseline

One random pair

Your decision

Cooperate

Other person's decision

Cooperate

Your payoff

60 ECU

Other person's payoff

60 ECU

The session ends after this round.

Continue

Powered by [oTree](#)

Figure 3.7: Outcome and closing. Private round outcome.

Participation summary

The activity has ended.

Baseline

1 round(s)

Cumulative payoff

60 ECU

You cooperated in 1 of 1 rounds.

Session completed

Remain on this screen while the instructor presents the aggregate results.

Powered by [oTree](#)

Figure 3.8: Individual summary.

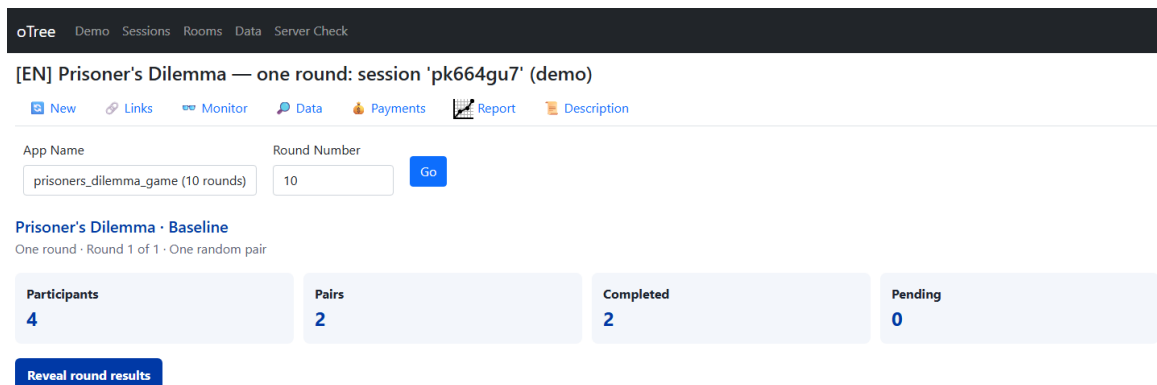


Figure 3.9: Aggregate report. Protected results.

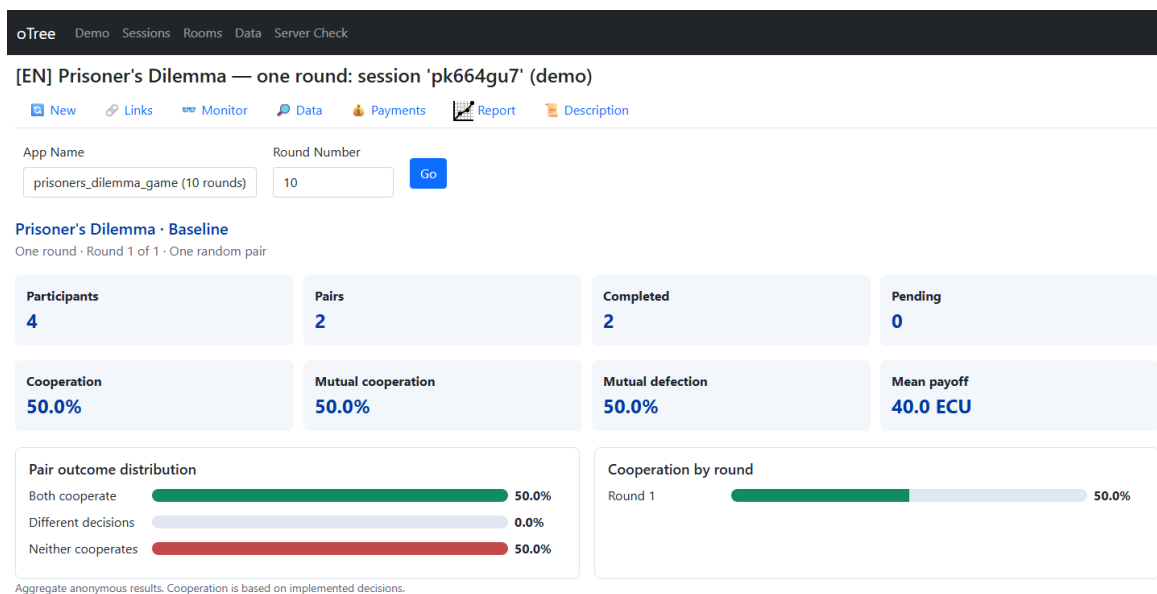


Figure 3.10: Indicators and distributions.

Theoretical foundations and evidence

4.1 One-shot interaction

If both players value only their ECU, D is strictly dominant: against C , $100 > 60$; against D , $20 > 0$. The unique Nash equilibrium is

$$(D, D)$$

, which gives 20 to each player. Yet

$$(C, C)$$

gives 60 to each and is Pareto superior. The divergence between individual rationality under the standard assumptions and joint efficiency defines the dilemma.

Laboratory evidence finds positive cooperation even in anonymous interactions without reputation. There is no universal cooperation rate: parameters, instructions, beliefs, and experience matter (Cooper et al., 1996; Sally, 1995).

4.2 Social preferences, reciprocity, and norms

A cooperative choice does not by itself establish confusion or pure altruism. People may value joint earnings, inequality, a cooperation norm, or their partner's intentions. Models of inequity aversion and reciprocity extend utility beyond monetary payoffs (Fehr and Schmidt, 1999; Rabin, 1993; Charness and Rabin, 2002). Cooperation may also depend on beliefs: a conditional cooperator can defect when exploitation seems likely.

Theoretical foundation

Separate three levels: the **observed action** (C or D), the participant's **belief** about the partner, and the underlying **motivation**. The game directly observes only the first; the other two require treatment comparisons or additional questions.

4.3 Ten rounds with a known horizon

With a fixed partner, a current choice can affect future behavior. Still, if round 10 is common knowledge, both players maximize money, and rationality is common knowledge, backward induction predicts D in the last round and then in every earlier round.

Experiments often show early cooperation followed by an end-game decline. Reputation, uncertainty about the partner's type, social preferences, learning, and limited reasoning can support cooperation

through part of a finite sequence ([Kreps et al., 1982](#); [Selten and Stoecker, 1986](#); [Andreoni and Miller, 1993](#)). An end-game decline is informative, but its absence does not demonstrate irrationality.

4.4 Indefinite horizon and the shadow of the future

Suppose another round occurs with probability δ , and permanent punishment follows a deviation. Cooperation can be sustained when

$$\frac{R}{1-\delta} \geq T + \frac{\delta P}{1-\delta} \iff \delta \geq \frac{T-R}{T-P}.$$

With $T = 100, R = 60, P = 20$, the threshold is 0.50. The indefinite-horizon treatment uses $\delta = 0.75$, which exceeds it. Mutual cooperation can therefore be an equilibrium; it is neither the unique rational outcome nor guaranteed to emerge. Evidence shows that robustness to strategic uncertainty matters as well ([Dal Bó, 2005](#); [Dal Bó and Fréchette, 2011, 2018](#)).

4.5 Fixed and random partners

A fixed partner permits direct reciprocity and bilateral reputation. Rematching weakens that channel, while learning, emotions, and population beliefs remain. The algorithm preserves A and B positions and attempts to avoid repeats; when there are fewer possible partners than rounds, some repeats are unavoidable. A classroom comparison is descriptive and becomes causal only under an appropriate assignment design.

4.6 Useful empirical regularities

- Initial cooperation is commonly positive and heterogeneous.
- With a known finite horizon, cooperation often declines near the end ([Selten and Stoecker, 1986](#)).
- Indefinite repetition increases cooperation when parameters support it, but equilibrium support alone does not imply high rates ([Dal Bó and Fréchette, 2018](#)).
- Communication usually increases cooperation in social dilemmas, conditional on content and credibility ([Sally, 1995](#); [Balliet, 2010](#)).
- In sequential games, B's action responds strongly to A's choice, consistent with conditional reciprocity ([Clark and Sefton, 2001](#)).

4.7 Implementing the basic game

4.8 Configurations

Configuration	Rounds	Matching
<code>prisoners_dilemma_en_1_round</code>	1	One random pair
<code>prisoners_dilemma_en_10_fixed_partner</code>	10	Same partner
<code>prisoners_dilemma_en_10_random_partners</code>	10	New partner each round

4.9 Before and during the session

Do not announce the standard prediction as the “correct” answer before decisions. Confirm understanding with the matrix and maintain silence among participants. In ten-round sessions, reveal each round only after everyone finishes; avoid discussing trends mid-session if comparability matters.

4.10 Basic-game feedback

Feedback script

1. Before revealing, elicit predictions for cooperation and pair outcomes.
2. Show (n), individual decisions, and pair outcomes.
3. Identify equilibrium

(D, D)

 , and compare its joint 40 ECU with 120 under

(C, C)

 .
4. Ask what participants expected from their partner and whether another belief would change their choice.
5. Over ten rounds, examine the trajectory and end game; compare fixed and random partners.
6. Close by separating descriptive classroom evidence from a causal treatment comparison.

Extended variants

5.1 Map of variants

Configuration	Change	Concept
<code>prisoners_dilemma_extended_communication</code>	Structured message	Promises and beliefs
<code>prisoners_dilemma_extended_sequential</code>	B observes A	Direct reciprocity
<code>prisoners_dilemma_extended_strategy_method</code>	B answers both cases	Conditional cooperation
<code>prisoners_dilemma_extended_high_temptation</code>	$T = 110$	Incentive strength
<code>prisoners_dilemma_extended_indefinite_horizon</code>	$\delta = .75$, maximum 10	Shadow of the future
<code>prisoners_dilemma_extended_implementation_error</code>	10% error	Noise and forgiveness
<code>prisoners_dilemma_extended_costly_punishment</code>	1:3 sanction	Enforcement and efficiency
<code>prisoners_dilemma_extended_social_information</code>	Previous-round data	Descriptive norms
<code>prisoners_dilemma_extended_observable_decisions</code>	Anonymous table	Observability
<code>prisoners_dilemma_extended_community_frame</code>	Language changes	Framing

5.2 Structured communication

Before choosing, each player selects one of four messages: an intention to cooperate, conditional cooperation, an individual orientation, or no additional message. The partner sees the message before deciding. Messages are nonbinding and free-form conversation is unavailable.

In the standard one-shot model, cheap talk does not change payoffs or remove the dominance of D . Empirically, communication can coordinate beliefs, activate norms, and increase cooperation (Sally, 1995; Balliet, 2010). The report shows cooperation and mean payoff by message sent.

Feedback script

Compare messages with actions. Which messages were credible? The association is not causal because each participant chose both message and action.

5.3 Sequential decisions

A moves first. B observes A's implemented action and then chooses. Backward induction with monetary self-interest predicts that B defects after either action; A anticipates this and defects.

B's behavior measures reciprocation by comparing cooperation after C with cooperation after D (Clark and Sefton, 2001).

Feedback script

Show B's conditional-response table. Do not equate reciprocation with unconditional altruism: the informative comparison holds role B fixed and changes A's observed action.

5.4 Strategy method

A chooses an action. Without observing it, B states what they would do if A cooperated and if A defected. The relevant response is then implemented. This elicits both contingent choices from every B, including the condition that did not occur. The procedure can change reasoning relative to a direct response (Brandts and Charness, 2011).

Feedback script

Classify B's patterns: always cooperate, always defect, reciprocate ($(C | C, D | D)$), or compensate ($(D | C, C | D)$). Compare stated strategy with realized behavior.

5.5 Higher temptation

The payoff from defecting against a cooperator increases from 100 to 110; all other payoffs remain 60, 20, and 0. Defection still dominates in one round. Under indefinite repetition, the permanent-punishment threshold rises from 0.50 to

$$\frac{110 - 60}{110 - 20} = \frac{5}{9} \approx 0.556.$$

Higher temptation makes cooperation harder to sustain by increasing the immediate gain from deviation.

Feedback script

Relate the change in (T) to the class's beliefs. A lower cooperation rate is consistent with stronger incentives, but a single session does not identify a causal effect.

5.6 Indefinite horizon

The pair remains fixed. After each round, play continues with probability 75%, subject to a technical maximum of ten rounds. The effective duration is drawn reproducibly for the session. Players therefore do not know a final round unless the cap is reached.

For the baseline matrix, $\delta = .75 > .50$, so contingent strategies can sustain cooperation. The report states the stopping round. The literature shows that sustainability does not guarantee selection of a cooperative equilibrium (Dal Bó, 2005; Dal Bó and Fréchette, 2011, 2018).

Feedback script

Before play, ask for the expected untruncated duration, $1/(1 - .75) = 4$ rounds. Afterwards, compare theoretical possibility, observed cooperation, and strategic risk.

5.7 Implementation error

During ten rounds with a fixed partner, each intended decision switches to the opposite action with probability 10%. Payoffs use the implemented action. The participant screens and export distinguish intentions from implementation.

Noise can trigger retaliation even when no one intended to deviate. Forgiving strategies can outperform irreversible punishment under imperfect implementation ([Fudenberg et al., 2012](#)). The report compares intended cooperation, implemented cooperation, and the share of changed actions.

Feedback script

Look for an error followed by sustained defection. Ask which response rule is robust to mistakes without making exploitation profitable.

5.8 Costly peer punishment

After observing actions and initial payoffs, each player may spend 0 to 10 ECU, capped by their initial payoff. Each ECUs spent reduces the partner's payoff by 3 ECU. Final payoffs cannot be negative. The report shows mean expenditure, the share who punish, and punishment by the partner's action.

Punishment may deter defection, but it destroys resources and may invite retaliation. In repeated dilemmas, more cooperation need not imply higher average payoffs ([Dreber et al., 2008](#)).

Feedback script

Compare cooperation, punishment expenditure, and joint earnings. Was punishment directed at defection, exploitation, or cooperators as well? Evaluate deterrence and cost separately.

5.9 Social information

Beginning in round 2, participants see the previous round's cooperation rate, mutual cooperation rate, and outcome distribution. The partner remains fixed. The information can update beliefs or create a descriptive norm, but the treatment combines social information, repetition, and fixed matching.

Feedback script

Check whether choices converge toward the majority. A time correlation may also reflect within-pair reciprocity or learning.

5.10 Observable decisions

After choices, everyone sees an anonymous table of each pair's actions and payoffs. Names and personal codes are excluded. Observability may activate comparison and social approval, although anonymity limits individual reputation (Rege and Telle, 2004).

Feedback script

Ask whether appearing in the table was expected to affect decisions and how anonymous the table felt. Do not identify pairs.

5.11 Community frame

The payoff matrix is unchanged. "Cooperate" becomes **contribute to the joint outcome**; "defect" becomes **choose the individual outcome**. Standard material self-interest predicts no change, while labels may activate different construals and norms (Lieberman et al., 2004; Rege and Telle, 2004).

Feedback script

Compare the community frame with neutral language. A difference shows context sensitivity; it does not establish that either frame reveals the "true" preference.

Interpretation and classroom feedback

6.1 Reading the report

1. **Participants, pairs, and completed:** verify denominators before interpreting percentages.
2. **Cooperation:** share of implemented individual choices equal to C .
3. **Pair outcomes:** mutual cooperation, different choices, and mutual defection.
4. **Mean payoff:** performance measure; it does not replace the distribution.
5. **Trend:** cooperation and payoff by round; inspect initial level, slope, breaks, and ending.
6. **Treatment panels:** messages, B's response, errors, or punishment as relevant.

6.2 Prediction matrix

Mechanism	Main prediction	Informative evidence
One-shot self-interest	Mutual defection	Dominance and pair outcome
Efficiency or joint concern	More cooperation	(C, C) and joint payoff
Conditional cooperation	C when C is expected or observed	Sequential or strategy response
Repeated reciprocity	Fixed exceeds random partners	Treatment trajectories
Known last round	End-game decline	Cooperation by round
Shadow of the future	More cooperation with high δ	Indefinite horizon
Communication	Messages coordinate beliefs	Action by message
Noise and forgiveness	Errors trigger breaks; forgiveness restores	Intention, implementation, sequence
Punishment	May raise C , at a cost	Cooperation, spending, payoff
Norm or social image	Information, observation, and frame change C	Baseline comparison

6.3 Recommended discussion sequence

Feedback script

1. Elicit predictions before revealing results.
2. Show sample size and confirm completion.
3. Compare individual dominance, equilibrium, and joint efficiency.
4. Describe the distribution before proposing mechanisms.
5. Discuss beliefs and strategies without asking anyone to reveal their own choice.
6. Connect patterns to repetition, reciprocity, communication, norms, or noise.
7. Compare treatments only when the implementation supports the comparison.
8. Close with the limits of a classroom demonstration.

6.4 Closing questions

- What minimum belief about the partner would have changed your choice?
- Was cooperation a preference, a strategy, or both?
- Which institution changes the dilemma: communication, continuity, observation, or sanctions?
- Which variant best separates trust, reciprocity, and norms?
- Does more cooperation always increase welfare when punishment is costly?

Data, limits, and troubleshooting

7.1 Data and privacy

The export includes configuration, round, anonymous participant and partner, position, intended and implemented action, message or contingent responses, punishment, payoffs, and comprehension attempts. Do not merge these data with names or student IDs. Research use requires separate consent, ethics review, and institutional data handling.

7.2 Responsible interpretation

Do not label participants selfish, naive, or irrational; do not grade decisions; do not show percentages without (n); and do not treat groups or sessions without random assignment as causal experiments. An observed monetary choice may reflect beliefs, preferences, comprehension, and context.

7.3 Common problems

Symptom	Action
“Please wait”	Check whether the partner finished; use Monitor .
User does not exist	The database was reset or the link is stale; create a new session.
No more pages	Do not reuse links; confirm that the version includes the summary.
Odd participant count	Correct the count before creating the session.
Report has no results	Wait for all pairs to finish the round, then press Reveal .
Repeated partners	Random matching may require repeats in a small class.
Route unavailable	Check the address and contact the laboratory server administrator.

Checkpoint

Before the first class, test with four windows or devices, generate mutual cooperation and mutual defection, reveal the report, and download the data.

Configurations

A.1 Basic

- `prisoners_dilemma_en_1_round`
- `prisoners_dilemma_en_10_fixed_partner`
- `prisoners_dilemma_en_10_random_partners`

A.2 Extended

- `prisoners_dilemma_extended_1_round`
- `prisoners_dilemma_extended_10_fixed_partner`
- `prisoners_dilemma_extended_10_random_partners`
- `prisoners_dilemma_extended_communication`
- `prisoners_dilemma_extended_sequential`
- `prisoners_dilemma_extended_strategy_method`
- `prisoners_dilemma_extended_high_temptation`
- `prisoners_dilemma_extended_indefinite_horizon`
- `prisoners_dilemma_extended_implementation_error`
- `prisoners_dilemma_extended_costly_punishment`
- `prisoners_dilemma_extended_social_information`
- `prisoners_dilemma_extended_observable_decisions`
- `prisoners_dilemma_extended_community_frame`

A.3 Glossary

Cooperation	Action <i>C</i> , which supports the joint outcome when mutual.
Defection	Action <i>D</i> , which maximizes own payoff against either partner action in the baseline matrix.

Strict dominance	One action pays more than another against every counterpart action.
Nash equilibrium	A profile in which no player gains from a unilateral change.
Pareto efficiency	No person can be made better off without harming another.
Reciprocity	A response conditioned on another person's action or perceived intention.
Continuation factor	Probability δ that another round occurs.
Strategy method	Decisions for every contingency before learning which occurs.
Implementation error	Random difference between intended and executed action.
Cheap talk	A nonbinding message that does not directly change payoffs.

Expanded teaching manual for nonspecialist instructors

This part brings together what an instructor needs to turn Prisoner's dilemma into a learning experience. It complements the operational material above. It can be read before the first session and reused as a script during the discussion of results. The central question is why two people may fail to cooperate even when mutual cooperation improves both outcomes. The guide always separates four levels: rules, benchmark prediction, observed behavior, and interpretation. Moving directly from a bar in a chart to a psychological explanation confuses those levels.

B.1 Conceptual map before opening the session

B.1.1 Unit of analysis

The relevant unit is the pair in each round and each individual decision within it. One data row is not always one independent person: the same person may decide repeatedly, and interacting participants share information, payoffs, or history. The instructor should therefore state what enters the numerator, what enters the denominator, and whether observations are people, decisions, pairs, groups, or rounds. This prevents thirty repeated decisions from being presented as thirty independent participants.

The task is to cooperate or defect simultaneously. Before presenting theory, ask students to restate the rule and identify what information is available when they decide. A correct calculation does not guarantee understanding of the strategic or behavioral structure. Check available actions, information, payoffs, order, and feedback timing separately.

B.1.2 Benchmark prediction

The starting point is: if temptation exceeds reward and punishment exceeds the sucker payoff, defection is dominant and mutual defection is the one-shot equilibrium. The benchmark is a disciplined comparison, not a moral statement about what a person ought to do. First write the assumptions that support it, then derive the action or pattern, and only then compare it with the class. If information, repetition, incentives, matching, or the reference point changes, derive the prediction again instead of carrying it over automatically.

Keep equilibrium, efficiency, and fairness separate. An action can be a best response and generate a poor joint outcome; another action can raise surplus and remain vulnerable to unilateral deviation. Likewise, an equal outcome need not be efficient, and an efficient distribution does not reveal the process that produced it. Asking the class to label each statement as positive, normative, or

strategic reduces confusion.

B.1.3 Alternative mechanisms

The literature and treatments permit discussion of reciprocity, conditional cooperation, inequality aversion, norms, communication, reputation, and learning. These mechanisms are not interchangeable labels. Two can predict the same baseline action and separate only when a treatment changes. The informative comparison therefore asks not only how much behavior occurred but also what experimental change should increase, reduce, or leave the pattern unchanged if one mechanism matters.

Organize discussion in three columns. Write the observed fact in the first, such as a share, median, or trajectory. List compatible mechanisms in the second. Record the additional evidence needed to distinguish them in the third. The third column is essential because a classroom session rarely identifies a stable preference or causal relationship by itself.

B.2 Worked example and explanation

Use payoffs $T=5$, $R=3$, $P=1$, and $S=0$. If the other person cooperates, defection pays 5 instead of 3; if the other defects, it pays 1 instead of 0. Defection therefore dominates. Yet both receive 3 under mutual cooperation and only 1 under mutual defection. The example separates equilibrium, efficiency, and social preferences.

Solve the example in six steps. First list actions and possible states. Second calculate payoffs or consequences without interpreting motives. Third derive the theoretical benchmark under its assumptions. Fourth identify the minimum observation needed to evaluate that benchmark. Fifth compare treatments while stating what is held constant and what changes. Sixth formulate a limited conclusion: “the pattern is consistent with” is more accurate than “the experiment proves” when rival explanations remain.

Then change one parameter and ask for a new prediction before calculating. This pause turns the example into a reasoning tool. It also reveals whether students memorized an answer or understood the mechanism. If answers diverge, ask each group to identify the assumption producing the difference.

B.3 Reading the instructor report

The central measures are individual cooperation rate; mutual cooperation; mutual defection; response to the previous action and evolution by round. Write the denominator next to every indicator. A rate can divide by eligible participants, completed decisions, formed pairs, groups, or rounds; these alternatives are not equivalent. If records are incomplete, show how many were excluded and why.

Use this reading order:

1. Verify participants, groups, and completed decisions. Do not interpret percentages before checking coverage.
2. Inspect the full distribution. A mean can hide two groups with opposing responses or a concentration at focal values.
3. Compare the median, range, and theoretically relevant categories. Explain whether the graph

counts people or decisions.

4. Inspect time paths only when rounds are comparable. Changes in matching or treatment must be marked.
5. Compare treatments with absolute differences and denominators, not merely with bars of different heights.
6. Select one anonymous case or sequence connecting rules and the aggregate. Never use it to identify or ridicule a student.

A visible difference in a small class is descriptive evidence from that session. Do not call it a causal effect without appropriate assignment, adequate size, and a comparison defined before seeing the data. Across classes, composition, time, and prior experience may change together. The pedagogical value lies in stating a prediction, confronting it with evidence, and asking what design would teach us more.

B.4 Step-by-step debrief script

Begin without revealing results. Ask for the benchmark prediction and which assumption students find most demanding. Record two quantitative class predictions. Next reveal the observation count and distribution, initially withholding the mean if it would distract from heterogeneity. Ask students to describe the chart without explaining causes.

In a second stage, show aggregate measures and ask: which observation contradicts the simplest prediction, which remains compatible with it, and what heterogeneity disappears in the average? Accept multiple explanations, but require each to yield a testable prediction. Introduce the variants: fixed or reassigned partner; communication; continuation probabilities; social information; third-party punishment. For each variant, identify the single changed element, predicted direction, and report measure to inspect.

Close by connecting the laboratory to environmental agreements, competition, teamwork, and rule compliance. Point out which elements of the real setting are absent: institutions, selection, repetition, long-run consequences, or rich information. The analogy is useful when it isolates a mechanism; it becomes misleading if the class assumes that the laboratory reproduces the full context.

A verbal sequence that works well is: “first describe,” “now derive,” “then interpret,” and “finally ask what evidence is missing.” This discipline allows a nonspecialist instructor to lead a rigorous discussion without treating every departure as a bias or every match as definitive confirmation.

B.5 Comparable class plans

B.5.1 A 50-minute class

Use one mode. Spend five minutes on rules and comprehension, five on private predictions, ten on the activity, five collecting predictions about the aggregate, fifteen revealing the report in layers, and ten connecting the result to theory. The goal is not to cover every variant but to ensure that every student can explain why two people may fail to cooperate even when mutual cooperation improves both outcomes. End with one written sentence separating outcome from mechanism.

B.5.2 An 80-minute class

Run the baseline and one variant from fixed or reassigned partner; communication; continuation probabilities; social information; third-party punishment. Allow ten minutes for instructions, fifteen for each treatment, twenty for comparing distributions, and fifteen for theory and applications. Before the second treatment, request a directional prediction. If the result points the other way, do not dismiss it: inspect comprehension, composition, denominators, and descriptive power.

B.5.3 A 110-minute class

Combine experience, derivation, and design. After two treatments, give small groups a rival explanation and ask them to propose a third condition that distinguishes it. Each group must define the manipulated variable, outcome, unit of analysis, and prediction. Close by comparing proposals with existing variants and with environmental agreements, competition, teamwork, and rule compliance. This stage turns the student from participant into experimental designer.

B.6 Frequently asked questions and model answers

Should theory be explained before play? In a first session, collect predictions without revealing the full solution. Explain rules, payoffs, and information. Then derive if temptation exceeds reward and punishment exceeds the sucker payoff, defection is dominant and mutual defection is the one-shot equilibrium. In a second session, reverse the order and assess whether theory improves prediction or only changes vocabulary.

Is there a correct answer? Separate a normative or equilibrium solution from a behavioral prediction. Theory supplies a conditional benchmark. The laboratory reveals what occurs and why a reasonable person may choose differently.

Does a departure prove irrationality? No. It may reflect omitted preferences, beliefs, error, weak comprehension, or a different institution. Check controls and incentives. Then treat reciprocity, conditional cooperation, inequality aversion, norms, communication, reputation, and learning as hypotheses requiring further comparisons.

Why show the distribution? The same mean can arise from moderate consensus or two opposing groups. A distribution reveals focal values, boundaries, and heterogeneity. In Prisoner's dilemma, connect those shapes to individual cooperation rate; mutual cooperation; mutual defection; response to the previous action and evolution by round.

How many observations are enough? There is no universal threshold for debriefing. A small class is useful when described cautiously. Treatment comparisons require several independent units, clear assignment, and common protocols. Repeated decisions do not create new participants.

Can sessions be pooled? Yes, if parameters and definitions remain fixed. Retain session identifiers and inspect each cohort first. If instructions, composition, or incentives change, document the heterogeneity.

What if results contradict the literature? Check rules, treatment, comprehension, exclusions, and calculation. If no error exists, preserve the result. A class need not reproduce a published estimate. Ask what design would distinguish chance, composition, and mechanism.

How can embarrassment be avoided? Project aggregates and anonymous sequences. Avoid personal labels. Describe actions and consequences. The laboratory studies decisions under specific rules; it does not diagnose traits.

Should the decision be graded? Do not grade agreement with a prediction. Assess understand-

ing: derive the benchmark, calculate a measure, explain a limitation, and design a comparison. Experimental incentives and academic assessment serve different purposes.

How should a variant be chosen? Begin with the mechanism to separate. Select from fixed or reassigned partner; communication; continuation probabilities; social information; third-party punishment, state a direction and measure, and hold other elements constant. Do not run more conditions than can be analyzed.

What conclusion is appropriate? Use three sentences: what was observed, which mechanism it is consistent with, and what evidence is missing. The connection to environmental agreements, competition, teamwork, and rule compliance should preserve those limits.

What should students remember? They should reconstruct the central tension, explain the benchmark, read the main denominator, and propose an institution that could change the outcome.

B.7 Diagnostic cases for interpretation practice

B.7.1 Agreement with the benchmark

The distribution is concentrated near the prediction derived from if temptation exceeds reward and punishment exceeds the sucker payoff, defection is dominant and mutual defection is the one-shot equilibrium. Do not conclude that everyone shared the same motive. Some calculated, others followed a signal, and others chose intuitively. The evidence supports the aggregate prediction under session conditions but does not identify individual reasoning. Ask what belief, process, or response-time measure would distinguish those routes.

Then introduce a variant from fixed or reassigned partner; communication; continuation probabilities; social information; third-party punishment. If the pattern remains when the seemingly obvious mechanism weakens, the original explanation needs revision. A correct prediction does not automatically validate all its assumptions.

B.7.2 Two groups with opposite behavior

Half the class is at one extreme and half at the other; the mean lies where almost nobody chose. Showing only the average would create a fictional description. Calculate the median, modes, range, and share in theoretical categories. Ask whether heterogeneity is related to role, round, treatment, or comprehension.

Consider reciprocity, conditional cooperation, inequality aversion, norms, communication, reputation, and learning. Write one additional observation for each. If it predicts role differences and none appear, it receives less relative support. If it predicts learning, inspect the trajectory. Do not fill missing measurement with a compelling story.

B.7.3 A large difference with few units

One treatment apparently doubles the main measure but contains two groups and the comparison contains three. Display each group before pooling. One extreme unit can create the difference. Twenty decisions nested in two groups are not twenty independent units.

Ask students to plan the next session: groups, assignment, primary measure, and exclusions. The answer should mention individual cooperation rate; mutual cooperation; mutual defection; response to the previous action and evolution by round and incomplete data. The experience thereby introduces design and transparency.

B.7.4 A null difference

Two conditions have the same mean. Before declaring that the manipulation does not matter, inspect compliance, comprehension, tails, and dispersion. Opposing subgroup effects can cancel. Define what range of differences would be pedagogically or economically meaningful and what size could distinguish it.

The cases teach four disciplines: do not infer motives from agreement, hide heterogeneity, confuse rows with units, or treat absence of evidence as evidence of absence.

B.8 Explanatory sequence for a complete class

B.8.1 Step 1: pose the problem without labels

Present the decision as a concrete situation and ask what information is missing. Do not announce the name of the bias, equilibrium, or preference at the start. The question is why two people may fail to cooperate even when mutual cooperation improves both outcomes. Collect private responses so the first speaker does not become a focal point.

B.8.2 Step 2: reconstruct rules and incentives

Ask one student to describe actions and another to describe consequences. A third explains available information. Draw the sequence. In Prisoner's dilemma, the decision is to cooperate or defect simultaneously. Do not move to interpretation until the class can calculate a simple case.

B.8.3 Step 3: derive the benchmark

Write if temptation exceeds reward and punishment exceeds the sucker payoff, defection is dominant and mutual defection is the one-shot equilibrium. Underline each assumption. Ask what happens if one fails. Distinguish a logical derivation from an empirical expectation: an equilibrium strategy need not be played immediately by everyone.

B.8.4 Step 4: record predictions

Request one prediction about the mean, another about the distribution, and a third about a variant. Predictions should use individual cooperation rate; mutual cooperation; mutual defection; response to the previous action and evolution by round. Preserve the record; later comparison reveals learning and reduces hindsight.

B.8.5 Step 5: reveal in layers

Show coverage first, then distribution, measures, and comparisons. At every layer request description before explanation. If someone proposes reciprocity, conditional cooperation, inequality aversion, norms, communication, reputation, and learning, ask what observation would distinguish it from another mechanism.

B.8.6 Step 6: work through one sequence

Use the worked example in this guide. Recalculate slowly and change one parameter. Ask each team to find one excessive conclusion and rewrite it with limited language. Editing claims is as important as calculation.

B.8.7 Step 7: compare institutions

Choose one condition from fixed or reassigned partner; communication; continuation probabilities; social information; third-party punishment. Write a table with constant, change, prediction, and measure. If the variant changes several elements, acknowledge it. Ask whether a third treatment would separate explanations.

B.8.8 Step 8: transfer and close

Connect the mechanism to environmental agreements, competition, teamwork, and rule compliance. Identify two differences between the laboratory and the real context. End with an exit response: prediction, evidence, compatible mechanism, and limitation. This structure assesses understanding without rewarding a particular decision.

B.8.9 A short script to read aloud

“Describe what happened before explaining why. Identify the prediction and its assumptions. Compare the distribution with the mean. Propose two compatible mechanisms. Finally, state which treatment or additional evidence could distinguish them.” The script keeps discussion in a common sequence across families.

B.9 Assessment bank with solutions

Exercise 1. List actions, information, and payoffs. **Solution:** reconstruct cooperate or defect simultaneously without adding information unavailable to the participant.

Exercise 2. Derive the material benchmark. **Solution:** begin from if temptation exceeds reward and punishment exceeds the sucker payoff, defection is dominant and mutual defection is the one-shot equilibrium and name at least two assumptions. For an interactive game, state best responses; for an individual task, state the decision rule.

Exercise 3. The report shows 40 percent. **Solution:** it cannot be interpreted without numerator, denominator, exclusions, and unit. Eligible people and completed decisions are alternative denominators.

Exercise 4. The mean matches the prediction. **Solution:** inspect the distribution. A correct mean can combine extremes, offsetting errors, or different strategies. Agreement does not identify reasoning.

Exercise 5. Select two mechanisms from reciprocity, conditional cooperation, inequality aversion, norms, communication, reputation, and learning. **Solution:** design a condition changing one prediction but not the other, with an outcome from individual cooperation rate; mutual cooperation; mutual defection; response to the previous action and evolution by round.

Exercise 6. Compare treatments of different sizes. **Solution:** report counts and shares, preserve the independent unit, and do not compensate for a small group by multiplying rounds.

Exercise 7. Mean differences are absent. **Solution:** inspect dispersion, tails, compliance, and comprehension; define a relevant difference. A broad null does not establish equivalence.

Exercise 8. Propose a figure. **Solution:** use histograms or dots for distributions, lines for rounds, separate bars for roles, and bivariate plots when a response depends on a prior action.

Exercise 9. Explain a variant from fixed or reassigned partner; communication; continuation probabilities; social information; third-party punishment. **Solution:** identify what changes, what remains constant, predicted direction, and an interpretive threat.

Exercise 10. Transfer to environmental agreements, competition, teamwork, and rule compliance. **Solution:** describe the common mechanism and two institutional differences. Do not claim that one session determines policy.

Exercise 11. Write a three-sentence conclusion. **Solution:** observation with denominator; compatible mechanisms; evidence needed to distinguish them.

Exercise 12. Design a replication. **Solution:** preserve parameters, record assignment, announce the primary measure, set exclusions, and archive the export.

A twelve-point rubric awards one point for each correct component. For a short assignment use Exercises 2, 3, 5, and 11. For a project use all twelve and request a reproducible figure.

B.10 Advanced seminar: from evidence to mechanism

Divide the class into four teams: benchmark model, alternative preferences or beliefs, institutions, and identification critique. Each interprets the same report from its assigned role. The first derives if temptation exceeds reward and punishment exceeds the sucker payoff, defection is dominant and mutual defection is the one-shot equilibrium; the second uses reciprocity, conditional cooperation, inequality aversion, norms, communication, reputation, and learning; the third selects a variant from fixed or reassigned partner; communication; continuation probabilities; social information; third-party punishment; the fourth identifies missing evidence.

In a replication round, every team writes a quantitative prediction and a condition that could refute it. It exchanges the proposal with another team, which audits unit, denominator, and manipulation. A useful explanation does not merely accommodate past outcomes; it risks a prediction about new evidence.

End with a one-page memo containing question, benchmark, descriptive finding, two mechanisms, discriminating design, application to environmental agreements, competition, teamwork, and rule compliance, and limitation. Grade causal clarity, technical correctness, use of evidence, and inferential restraint.

For a quantitative extension, export data and reproduce three figures: individual distribution, aggregate by independent unit, and treatment comparison. All three require titles, denominators, and exclusion notes. Compare how the narrative changes when the correct unit is used.

An ethics extension asks which decisions should remain private, when an incentive is proportionate, and how to communicate results without turning group patterns into personal judgments. The answer should separate participant protection, instructional integrity, and analytical transparency.

Selected bibliography

For orientation: [Camerer \(2003\)](#), [Cooper et al. \(1996\)](#), and [Dal Bó and Fréchet \(2018\)](#). Repetition: [Kreps et al. \(1982\)](#), [Dal Bó \(2005\)](#), and [Dal Bó and Fréchet \(2011\)](#). Variants: [Clark and Sefton \(2001\)](#), [Brandts and Charness \(2011\)](#), [Fudenberg et al. \(2012\)](#), [Dreber et al. \(2008\)](#), [Balliet \(2010\)](#), and [Liberman et al. \(2004\)](#).

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