



Teacher guide to treaties and global public goods

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, implementation, and classroom discussion of the family of treaties and global public goods games available through the Behavioral and Experimental Economics Research Lab (BEER Lab) at the Department of Economics of Tecnológico de Monterrey. It is intended for instructors with different levels of familiarity with experimental and behavioral economics.

The document offers three reading paths. The **quick guide** is enough to launch a session. The operational chapters explain each screen used by instructors and students. The conceptual chapters present the theories, predictions, and empirical findings needed to lead the post-game discussion.

Access instructions and common screens are explained once. Each variant then focuses only on what changes relative to the basic game: configuration, group size, decisions, predictions, relevant outcomes, and academic literature.

Author

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For the instructor

This guide follows the English-language interface. Spanish configurations use the same logic. Never project individual codes or connect outcomes to names, student identification numbers, or seats in the room.

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Preparing an international cooperation class

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.

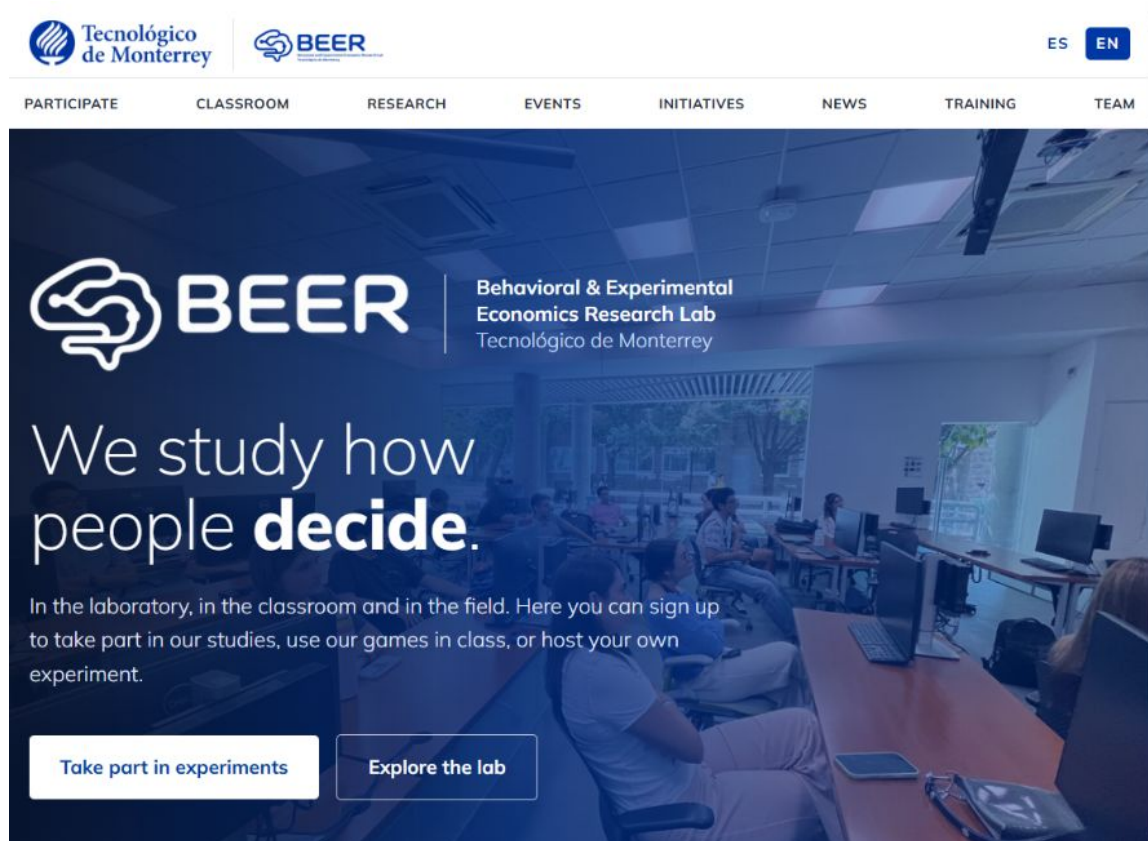


Figure 1.1: Current institutional website. Select CLASSROOM in the top navigation menu to open the teaching experiments. Captured on October 7, 2026.

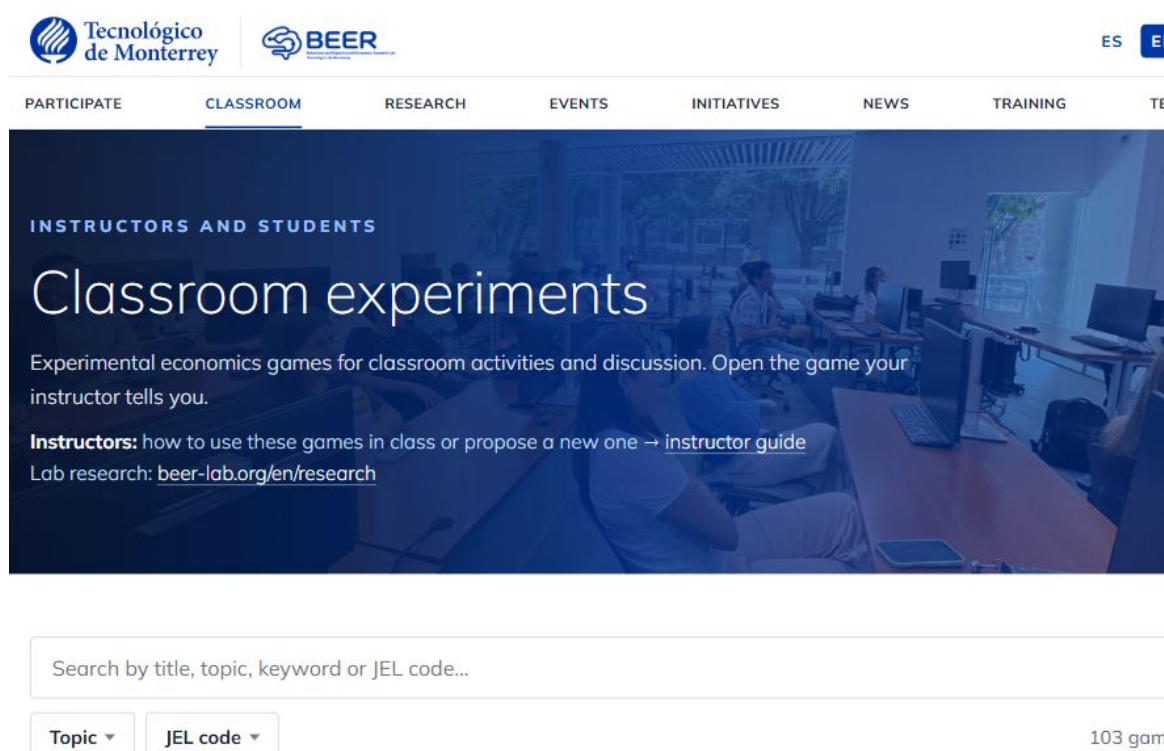


Figure 1.2: Current catalog: search by title, topic, or JEL code. Then locate this family's card and select language and edition. Captured on October 7, 2026.

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.

e cuatro periodos
s, grupo fijo
s, grupos reasignados
s
rto: 60 o 100
érdida: 25%
érdida: 90%
gual: 20, 20, 60, 60
ial: 50%, 50%, 100%, 100%
gual y transferencias
ecutadas automáticamente
oductivo de acceso común
oductivo exclusivo de miembros
miembros sin condición de aportes
miembros condicionado a 20 ECU
eriod block
fixed groups
reassigned groups

Tratados y bienes públicos globales / Treaties and Global Public Goods — BEER Lab

Selecione una variante de este juego. Select a version of this game.

Figure 1.3: Demo contains only the configurations of this game family, in both languages and editions. Continuation 1/2.

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 Purpose and experimental unit

This activity introduces an international relations problem: several actors must pay for a common objective even though each can benefit from other actors' effort. The common benefit in this implementation is avoiding a loss of remaining wealth. A contribution does not earn an immediate return. It is a cost paid now to change the collective outcome later. Students therefore face a coordination problem, a distributional question and an incentive to leave part of the bill to others.

igual y transferencias
BE
ejecutadas automáticamente
productivo de acceso común
productivo exclusivo de miembros
miembros sin condición de aportes
miembros condicionado a 20 ECU
period block
fixed groups
reassigned groups
threshold: 60 or 100
%
%
alth: 20, 20, 60, 60
50%, 50%, 100%, 100%
alth and transfers
ly implemented pledges
s productive benefit
nly productive benefit
cess without contribution requirement
cess conditional on 20 ECU

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

Rooms

Current rooms:

[ES] Tratados: básica
[EN] Treaties: basic
[ES] Tratados: extendida
[EN] Treaties: extended

Figure 1.5: Rooms contains the four rooms for this family: basic and extended editions in Spanish and English.

Room: [EN] Treaties: basic

Create a new session

Session Config

[EN] One four-period block

Number of participants

Complete groups of 4 participants. Use a multiple of 4; minimum 4.

Create

[Configure session](#) 

App sequence

treaties_game (10 rounds)

Treaties and Global Public Goods / Tratados y bienes públicos globales.

Figure 1.6: Session-creation form for the basic English room. Check the selected configuration and participant requirement before creating the session.

The instructor should distinguish these three issues before discussing whether observed cooperation was sufficient.

The experimental unit is a group of four people completing one block of four periods. An oTree round represents this entire block, rather than a single contribution period. Wealth persists across all four decisions and is restored only when another block begins. A group remains unchanged within its block. Basic configurations offer one block, ten blocks with fixed groups, and ten blocks with random reassignment between blocks. Reassignment may bring a previous partner back: the procedure does not promise that every group contains entirely new people. In a four-person session, meaningful reassignment cannot occur; use at least eight people for that comparison.

Participants see neutral positions numbered one through four. They do not receive country names, labels such as responsible or selfish, or statements of the hypothesis. The instructor may connect the mechanism to environmental agreements during the discussion. This separation prevents the interface from telling students which behavior is desirable. It also makes the activity useful for comparing promises, funded transfers and access conditions without changing the moral meaning of the participant instructions between treatments. Students learn the exact payment rules before acting; they need not know the research vocabulary to make an informed choice.

Learning objectives are to identify a global public good, distinguish a common event from an independent individual risk, reconstruct a budget over several periods, explain the difference between an announcement and an enforceable commitment, and compare inclusive collective protection with an excludable productive benefit. Students should also recognize that reaching the target does not prove equal burden sharing. Four people can protect the group with very different contributions. Conversely, equal contributions can be too small to protect anybody. Cooperation, coordination, fairness and realized payoffs are related measures, but none can substitute for the others.

Purpose

Study international cooperation under common risk, pledges, inequality and productive access.

Experimental unit	Four people, four periods per block; wealth persists within each block.
Basic edition	One block or ten blocks with fixed groups or reassignment across blocks.
Extended edition	Twelve treatments of information, pledges, risk, inequality, transfers and access.
Decision	Pledge and contribute ECU; preliminary sends or membership in relevant treatments.
Payoff	Remaining wealth after the common event plus protected productive output when applicable.
Topics	international cooperation; global public goods; collective risk; environmental agreements; inequality; trade linkage.
JEL	C92; F53; H41; Q54.
Participants	Multiples of four; at least eight for reassignment.
Suggested duration	35–50 minutes for one block and discussion; classroom pilot pending.

1.3 Access, rooms and session preparation

Begin at <https://beer-lab.org/> and follow the teaching-games link to <https://teaching.beer-lab.org/>. Locate the bilingual card for Treaties and Global Public Goods. The proposed family address is <https://treaties.beer-lab.org/>. The student room for basic English is https://treaties.beer-lab.org/room/treaties_en. The remaining rooms are `tratados_es`, `tratados_extendido` and `treaties_extended` under the same domain. Publication requires the laboratory deployment procedure; a committed package or a working local demonstration does not establish that the public address is live. The verified local demonstration uses <http://localhost:8093/demo> on the computer running this instance.

The instructor enters the private administration interface, chooses Rooms, opens the relevant basic or extended room and creates a session. Demo is convenient for checking a configuration beforehand. It is not a substitute for assigning distinct participant links during a class. Each person needs their own link, and opening the same link twice does not create an additional actor. Keep Monitor and Report in separate tabs. The room link admits students to the session assigned to that room; a participant link identifies one seat inside that session. These routes serve different purposes and should never be distributed interchangeably.

Demo contains thirty configurations belonging only to this family. Rooms contains exactly four rooms. Each basic room lists three configurations, and each extended room lists twelve. The basic English room initially selects an English basic configuration. If a different family appears, stop before creating a session and check the family setting with laboratory coordination. There is no educational reason for this activity to display unrelated games. The local database is also separate from other families, so Sessions and Data should contain only sessions created for this instance, including any synthetic checks used during preparation.

Count attendees and choose a multiple of four. Do not fill a missing seat by asking an instructor to simulate a participant whose incentives are different. For fixed and reassigned comparisons, prepare more than one group and explain that the same wealth rules restart at every block. Estimate thirty-five to fifty minutes for instructions, one block and discussion, with additional time for a longer sequence. This estimate is a planning aid, not an observed classroom duration. Technical checks with automated participants do not measure how long students need to understand the

task or discuss the results.

For the instructor

Prepare the configuration, participant count and report before admitting students. Project instructions or aggregates, never individual access codes. Keep the result section hidden until the chosen stopping point, and identify incomplete groups before interpreting any average.

1.4 Organizing comparisons without confounding them

A useful first comparison gives one set of groups the baseline and another set no preliminary pledges. Keep initial wealth, target, loss probability, group size and horizon identical. A second comparison changes threshold information while maintaining the same mean target. A third examines unequal wealth before introducing funded transfers. Avoid running every extended configuration in a single class. The complete package provides choices for different teaching questions; it does not imply that students can absorb all mechanisms at once. Select the smallest set that answers the lesson's question and reserve the rest for later classes or assignments.

When using several sessions, record configuration, language, number of groups and whether students had previously played another treatment. An experienced group may coordinate differently because it has learned the interface, seen another report or inferred a focal contribution. Running the baseline before an institution for everybody confounds the institution with experience. Separate inexperienced groups provide a cleaner comparison, although small classroom samples still limit inference. If a within-class sequence is pedagogically useful, describe it as a sequence of demonstrations and discuss the learning effect openly. Do not describe its difference in averages as an experimentally identified causal effect.

The thirty configurations are not thirty distinct theories. Languages share the same accounting, and the basic modes share the same within-block decisions. Twelve extended treatments change announcements, information, risk, resources, exposure or productive access. Their controls are deliberately included: an exclusive club needs an open-access comparison, and contribution-conditioned access needs an otherwise identical member-access comparison. A treatment label alone is insufficient to establish what changes. Use the mechanism and budget descriptions below when choosing a comparison, and retain that description alongside the session data for later interpretation.

Following the participant sequence

2.1 Welcome and comprehension

The welcome screen identifies the Behavioral and Experimental Economics Research Lab in the Department of Economics at Tecnológico de Monterrey. It explains the learning purpose of controlled decision activities. Participants acknowledge rules requiring silence, private individual choices and adherence to the screen instructions. They should raise a hand for private assistance, rather than consult a neighbor. These rules do not prohibit a communication stage that the application explicitly provides; they prohibit communication outside that stage. In this family, announcements are structured numerical promises, rather than unrestricted conversation or bargaining over a written treaty.

Instructions describe four simultaneous contribution decisions, persistent wealth, the target and a common final event. They also show the public wealth, period maximum and exposure of every position. The baseline example is a group in which everybody starts with forty ECU and contributes five in each period. Four people times four periods times five ECU equals eighty, so the target is reached and everybody keeps twenty. A second example explains that zero contributions leave forty at risk, producing an expected payoff of ten at the baseline loss probability. These examples teach accounting; they do not prescribe a choice.

Three comprehension questions concern the baseline example, explicitly labeled as such even in an extension. The correct answers are a total contribution of eighty, no refund after failure, and one common loss draw in a failed block. This last question is especially important. If students imagine an independent draw every period, they perceive a different probability of eventual loss and may make decisions for an activity that does not exist. A wrong answer returns a translated explanation and keeps the participant on the comprehension page. Help by reviewing the rules rather than revealing what other participants are choosing.

What participants will see

Students see the rules needed to act, public budgets and exposure, their own remaining wealth, announced promises when present, and contribution totals after each completed period. The interface uses group positions and ECU; it does not name political hypotheses.

Checkpoint

Before class, verify one complete English and Spanish route with four seats. Check the wait, translated validation, single main title, final screen and report. Reuse shared logic checks across languages; a translation check does not require repeating every accounting case.



Group decisions

Block 1 / 1 · Basic

The Behavioral and Experimental Economics Research Lab (BEER Lab), in the Department of Economics at Tecnológico de Monterrey, provides a space to learn about economic decisions through controlled activities.

Remain silent. Do not talk or communicate with other participants. Decide individually and privately. Follow the instructions. Do not refresh, close or leave the page. If you need help, raise your hand and contact staff privately.

☐ I have read and accept these rules.

ECU are accounting units. This exercise promises no conversion to money.

Continue

Figure 2.1: Read and acknowledge the laboratory rules.



Instructions

Block 1 / 1 · Basic

Resources and unit of account

Starting account per participant and round: 40 ECU.

ECU stands for Experimental Currency Units. It is the unit of account for this activity.

This session does not convert ECU into real money.

There are four people. A block has four periods. In each period everyone simultaneously chooses an integer contribution within their maximum and available wealth. Contributions are spent and never refunded. Contributions by position are shown after each period. At the end of period four, total contributions are compared with the target. If it is reached, you keep remaining wealth. Otherwise one common random draw occurs: everyone faces the same event, with the loss share specified for their position. There are not four draws and contributions generate no immediate income.

Wealth is restored at the beginning of another block. Blocks are independent and their payoffs are added. The group stays together throughout all four periods.

Figure 2.2: Current instructions for the basic edition: Initial resources, decision rules, and experimental units. Continuation 1/2.

Fixed group across blocks / Random reassignment across blocks: One block

Wealth, maximum and exposure are public for every position.

Position	Initial wealth	Maximum per period	Share of wealth lost in that event %
1	40	10	100
2	40	10	100
3	40	10	100
4	40	10	100

Loss probability if the target is missed: **75%**

Final target: **80 ECU**

The statement will be visible to your group. It does not guarantee what others will do.

The pledge is not binding: you choose your contribution in each period.

Instructions

Block 1 / 1 · Basic

Resources and unit of account

Starting account per participant and round: 40 ECU.

ECU stands for Experimental Currency Units. It is the unit of account for this activity.

This session does not convert ECU into real money.

There are four people. A block has four periods. In each period everyone simultaneously chooses an integer contribution within their maximum and available wealth. Contributions are spent and never refunded. Contributions by position are shown after each period. At the end of period four, total contributions are compared with the target. If it is reached, you keep remaining wealth. Otherwise one common random draw occurs: everyone faces the same event, with the loss share specified for their position. There are not four draws and contributions generate no immediate income.

Wealth is restored at the beginning of another block. Blocks are independent and their payoffs are added. The group stays together throughout all four periods.

Fixed group across blocks / Random reassignment across blocks: One block

Wealth, maximum and exposure are public for every position.

Position	Initial wealth	Maximum per period	Share of wealth lost in that event %
1	40	10	100
2	40	10	100
3	40	10	100
4	40	10	100

Loss probability if the target is missed: **75%**

Final target: **80 ECU**

The statement will be visible to your group. It does not guarantee what others will do.

The pledge is not binding: you choose your contribution in each period.

Baseline example: with wealth 40 and target 80, if each position contributes 5 in each period, total contributions reach 80; everyone keeps 20 ECU and no loss draw occurs. If nobody contributes, each person keeps 40 with probability 25% and receives 0 with probability 75%.

Continue

Con tecnología de oTree

Figure 2.3: Current instructions for the basic edition: initial resources, decision rules, and experimental units. Continuation 2/2.



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



Comprehension

Block 1 / 1 · Basic

Resources and unit of account

ECU stands for Experimental Currency Units. It is the unit of account for this activity.

This session does not convert ECU into real money.

Baseline example: with wealth 40 and target 80, if each position contributes 5 in each period, total contributions reach 80; everyone keeps 20 ECU and no loss draw occurs. If nobody contributes, each person keeps 40 with probability 25% and receives 0 with probability 75%.

In the baseline example, how much does the group contribute in total?

Your answer: 81. The correct answer is 80. Review the example: total 80, no refund and one common draw at the end.

Are contributions refunded if the target is missed?

How many common loss draws occur in a failed block?

Continue

Con tecnología de oTree

Figure 2.4: Current comprehension check with an incorrect answer, its specific explanation, and retained responses.

2.2 Block start and preliminary stages

At the beginning of a block, the participant sees their position, available wealth, target and loss probability. The group table makes resource and vulnerability differences public. The readiness wait synchronizes the four participants. An early arrival cannot make a contribution using another person's unfinished announcement. This timing is part of the design: decisions described as simultaneous become visible only after the corresponding group stage is complete. Within a block, a position does not change. In reassigned blocks, a person may receive a different position and group when the next encounter starts.

The transfer treatment adds a preliminary funded send. Each person can send zero through ten ECU to one other position. All sends occur simultaneously. The sender cannot use an incoming transfer that has not yet been received to finance their own send. After everyone submits, sent amounts are subtracted and received amounts are added. Transfers create no new global wealth. The public period maximum remains tied to initial wealth, so receiving a transfer increases the recipient's available budget without silently changing their contribution technology. This distinction is visible in the announcement and decision screens.

The four productive-access treatments add a membership decision before pledges. Joining costs four ECU from initial wealth. With fewer than two members, no productive output is generated and the fee is not refunded. With at least two, every four-ECU membership input generates twelve ECU of output. Open access divides total output across all four positions. Exclusive access assigns twelve to each member. Linked access additionally requires a member's contribution total to reach twenty. These benefits are paid at the end and protected from the common wealth-loss event. The instructions state these details before the membership choice.

Ordinary pledges are integer announcements between zero and the lesser of available wealth and four period maximums. Everyone announces before any contribution is shown. The announcement is visible to group members, but it does not constrain later decisions. A person may contribute less, exactly as much, or more than they pledged. In the no-pledge treatment, this stage is absent, rather than replaced by a zero-valued promise. Treating an absent promise as zero would distort the fulfillment measure. The binding treatment instead implements the announced total automatically in four balanced integer installments.

2.3 Contributions, information and closure

In each ordinary contribution screen the participant sees the period number, their remaining wealth and the maximum contribution. Choices are whole ECU, nonnegative and funded. The application rejects a contribution exceeding either the period cap or available wealth after previous contributions. The group's accumulated contributions and announced promises are displayed using information from completed stages only. Current choices remain private until all four people finish. Nobody can condition their simultaneous choice on a current contribution that was submitted early by another person. The next feedback page shows the cumulative outcome by group position.

Feedback follows periods one, two and three. It does not pay an interim dividend, reset wealth or conduct a loss draw. This matters when discussing learning: a higher late contribution may respond to a funding gap, observed promises or a previous pattern, while all remain decisions inside one encounter. Four contribution periods from the same group are not four independent groups. The fourth decision goes directly to the block outcome after synchronization. If the target is reached early, the four-period horizon still continues; additional contributions are feasible but unnecessary for protection in the known-target reference.

The result page separates contributions, remaining wealth, productive benefits, realized payment



Statement of intention

Block 1 / 1 · Basic

Position

2

Remaining wealth

40 ECU

Final target

80

Loss probability if the target is missed

75%

The statement will be visible to your group. It does not guarantee what others will do.

The pledge is not binding: you choose your contribution in each period.

Available wealth: 40 ECU · Maximum per period: 10 ECU

Total pledge for this block

20

Continue

Figure 2.5: Distinguish pledges from actual contributions.



Preliminary transfer

Block 1 / 1 · Extended

Position

4

Remaining wealth

60 ECU

Final target

80

Loss probability if the target is missed

75%

You may send 0 to 10 ECU to one other position. The transfer is subtracted from your wealth and added to the recipient's before pledging and contributing. Everyone sends simultaneously. Incoming transfers not yet received cannot fund your transfer.

Sent

Receiving position

Continue

Figure 2.6: Fund the transfer and select another position.



Access decision

Block 1 / 1 · Extended

Position

2

Remaining wealth

40 ECU

Final target

80

Loss probability if the target is missed

75%

Joining costs 4 ECU from initial wealth. With at least two members, the activity converts each 4 ECU cost into 12 ECU of output. With fewer than two, there is no output and the cost is not refunded. The benefit is paid at the end and protected from the common loss.

Each member receives 12 ECU if there are at least two members. Nonmembers receive none of this benefit.

Would you like to join the productive activity?

Yes



Continue

Figure 2.7: Review costs, production and exclusion before joining.

and expected payment immediately before the final draw. A successful block has no loss draw. A failed block has one persisted common draw shared by all positions. Refreshing the result page does not generate a new event. In repeated modes, the screen also shows the sum of block payoffs. The final screen explicitly says the activity is complete and has no advance button. Students should wait for the instructor's directions; they should not close the activity merely because other people appear to have finished.

A useful screen-reading exercise compares two feasible plans in the known-target reference. In the first, every position contributes five in each of the four periods. After periods one, two and three, the group sees cumulative totals of twenty, forty and sixty; the final total is eighty. In the second, every position contributes zero, zero, ten and ten. Both plans spend twenty per person and produce the same protected wealth and final payoff. Their information paths differ. The second plan leaves all funding to the final two periods, so the early feedback alone cannot establish that the group will fail. Ask students to distinguish an observed contribution from a prediction about a remaining decision.

The remaining capacity can also make the feedback informative. Suppose three periods have ended and the group total is fifty. Each position can still contribute at most ten, so the group can add at most forty; reaching eighty remains feasible and requires thirty more. If the cumulative total were thirty instead, even forty additional ECU would leave the group at seventy. The known target would be unreachable. Remaining individual wealth can lower this maximum further, especially after transfers or membership fees. For an uncertain target, compare feasible totals with both possible thresholds rather than assuming the hidden realization. These calculations use completed-stage information: they do not reveal any current private choice. They help explain a late



Contribution this period

Block 1 / 1 · Basic

Position 3	Remaining wealth 40 ECU
Final target 80	Loss probability if the target is missed 75%

Figure 2.8: Compare contribution, cap and available wealth. Continuation 1/2.

Period 1 / 4 · Maximum per period: 10 ECU

Cumulative group contributions: 0 ECU

Position	Announced pledges	Cumulative contributions
1	20	0
2	20	0

Contribution this period

Block 1 / 1 · Basic

Position

3

Remaining wealth

40 ECU

Final target

80

Loss probability if the target is missed

75%

Period 1 / 4 · Maximum per period: 10 ECU

Cumulative group contributions: 0 ECU

Position	Announced pledges	Cumulative contributions
1	20	0
2	20	0
3	20	0
4	20	0

Contribution this period

Continue

Figure 2.9: Compare contribution, cap and available wealth. Continuation 2/2.



Period information

Block 1 / 1 · Basic

Position

3

Remaining wealth

35 ECU

Final target

80

Loss probability if the target is missed

75%

Period 1 / 4

Position	Announced pledges	Cumulative contributions
1	20	5
2	20	5
3	20	5
4	20	5

Cumulative group contributions: 20 ECU

[Continue](#)

Figure 2.10: Observe cumulative totals after a completed period.



Block outcome

Block 1 / 1 · Basic

Position

3

Remaining wealth

20 ECU

Final target

80

Loss probability if the target is missed

75%

Target reached · No loss draw was conducted

Cumulative contributions

20

Productive benefit

0

Your realized payoff

20 ECU

Expected payoff before the draw

20 ECU

Sum of your block payoffs: 20 ECU

[Continue](#)

Figure 2.11: Separate protection, the event and individual payment.



Activity completed

Block 1 / 1 · Basic

Your decisions and payoffs have been recorded. The activity has ended; wait for your instructor's directions.

Sum of your block payoffs: **20 ECU**

Figure 2.12: Confirm completion and wait for instructor directions.

Understanding collective risk and coordination

3.1 Budget and expected payoff

Let initial wealth be W_i , transfers sent and received be S_i and R_i , membership fee be f_i , and contributions in the four periods be c_{it} . Available wealth is W_i minus S_i plus R_i minus f_i . Total individual contribution C_i is the sum of the four decisions. Remaining wealth is available wealth minus C_i . The group total C sums all four individual totals. A target T is reached when C is at least T . If it is missed, the common loss event occurs with probability q . Exposure v_i determines the fraction of remaining wealth lost in that event.

$$A_i = W_i - S_i + R_i - f_i, \quad C_i = \sum_{t=1}^4 c_{it}, \quad w_i = A_i - C_i.$$

Productive benefit b_i is an additional terminal amount determined by membership and access rules. Payment equals remaining wealth times one minus the exposure-weighted loss indicator, plus this benefit. Expected payment before the common draw equals remaining wealth times one minus q times exposure if the group missed the target, again plus the productive benefit. In a successful block, expected and realized payments coincide. In a failed block, an observed favorable outcome does not mean the group avoided risk through cooperation. The distinction between the decision and its random consequence should guide every discussion of success.

$$\pi_i = w_i (1 - v_i \mathbf{1}\{C < T\} \mathbf{1}\{U < q\}) + b_i.$$

Consider the reference profile: everybody contributes twenty over the block, so group contributions are eighty and each retains twenty. Group realized and expected wealth are both eighty. If nobody contributes, remaining group wealth is one hundred sixty, but expected group wealth is forty because only a quarter is retained on average. Protection at the exact target therefore doubles expected group wealth in this comparison. It does not maximize the gross wealth left before risk. Contributions consume resources; their value is the reduction in expected loss. Confusing gross remaining wealth with expected welfare gives the wrong recommendation.

3.2 Pivotality and multiple outcomes

A person is pivotal when their contribution changes whether the target is reached. Suppose the other three contribute sixty altogether. The fourth can supply twenty, obtain protection and

retain twenty. Contributing nineteen leaves the group at seventy-nine and their own remaining twenty-one at risk. At q equal to three quarters, the expected payoff is five and one quarter. In this situation, supplying the last ECU needed for protection is privately attractive. But if the others contribute only thirty and the person can contribute at most forty, they cannot bridge the gap alone. Their marginal contribution may consume wealth without obtaining protection.

When the others already supply eighty, a selfish risk-neutral participant prefers to contribute zero, since their contribution no longer improves protection. When everybody expects the others to supply little, zero can also be individually optimal because one person cannot reach the target. These incentives explain why the activity is more complicated than a linear public-goods game with a constant marginal return. The return to a contribution depends on the whole group's position relative to the threshold. Protection can be a focal collective aim even though allocating its cost remains contested and low-contribution expectations can support failure.

At the reference profile of twenty each, withdrawing one ECU changes success into failure. Payment falls from twenty to an expected five and one quarter; increasing contribution reduces retained wealth without additional protection. Thus the exact-target profile provides a useful Nash benchmark for the aggregate contribution game. This statement assumes risk neutrality, self-interest, full knowledge of the target and the ability to implement that total over the four periods. It does not select a unique period-by-period strategy. A dynamic analysis must consider histories, remaining caps and credible future actions; the static benchmark should not be presented as a complete unique solution of the sequential game.

Theoretical foundation

The target changes the marginal value of a contribution. Near a pivotal gap, one ECU can protect substantial remaining wealth; far below the target, a contribution may change nothing. The exact-target benchmark therefore coexists with coordination failure under different expectations.

3.3 Time, promises and social preferences

The four-period structure lets participants respond to past contributions. Early effort can reduce uncertainty about whether others will contribute, while waiting preserves flexibility. A late contribution may rescue a group but can also become impossible because the remaining period maximum is too small. If the total after period three is thirty, a fourth-period aggregate maximum of forty cannot reach eighty. Even unlimited willingness in that final period would not overcome the programmed cap. Teach students to distinguish a funding gap from a feasible funding gap. The timing distribution conveys information beyond the final sum.

Promises can provide a focal allocation of the cost. Four announcements of twenty identify a feasible exact-target plan, yet do not ensure execution. Observed deviations may reflect strategic free riding, revised expectations, accidental misunderstanding or a coordination response. A signed gap measures contribution minus announcement; it does not identify dishonesty by itself. A promise of twenty followed by twenty-five is overfulfillment, while a promise of thirty followed by twenty is underfulfillment. If the group succeeds with the latter profile, collective protection and individual promise fulfillment still tell different stories. Binding announcements remove this implementation margin, but can change the amounts people announce.

Fairness can concern equal absolute contributions, equal contribution shares, equal final wealth or equal expected losses. These criteria coincide in some symmetric examples and diverge under inequality. A person starting with twenty who contributes ten pays half their initial wealth; a person starting with sixty who contributes ten pays one sixth. The report must therefore be read

with the public starting resources beside contribution averages. Unequal vulnerability creates another distinction: identical wealth and equal contributions can leave different expected stakes. None of these observations automatically proves a particular social preference; the activity makes the competing principles concrete enough to discuss.

Students may care about group success, dislike unequal burdens, reciprocate early effort or follow an announced rule. Such behavior can generate higher contributions than a simple low-contribution expectation would suggest. Avoid diagnosing altruism from a single generous act: the person may have been pivotal and acting in their own material interest. Likewise, a zero contribution in a protected group may be free riding, but a zero in an unreachable group can reflect a different situation. Begin with the available information and incentives at that decision, then discuss which additional motivations are compatible with the pattern.

Choosing and interpreting extensions

4.1 Announcements and enforceability

The no-promises treatment removes the announcement stage while preserving baseline resources, risk and contribution decisions. Compare protection rates, effort timing and contribution dispersion with the ordinary baseline. An improvement with promises is compatible with coordination through a focal plan, but the class does not directly elicit expectations. Do not claim that beliefs changed unless another design measures them. The absence of a promise is recorded as missing, and the report excludes it from the gap denominator. This treatment is a control for the announcement mechanism rather than a claim that international diplomacy consists of numerical statements alone.

The binding treatment uses the same group and target, but the announced total is executed automatically. A pledge of twenty becomes four contributions of five. A pledge of twenty-three becomes six, six, six and five. Remainders are assigned to the earliest periods, so the rule is public and deterministic. The announcement must fit both available wealth and total period capacity. Once it is submitted, later contribution forms are omitted and feedback displays the installments. This is an institutional commitment benchmark with costless perfect implementation. It is not a model of national sovereignty, treaty litigation or costly inspection.

Compare announcements as well as total contributions. Automatic execution mechanically sets the promise gap to zero, so a lower gap cannot alone establish more willingness to cooperate. People might pledge less when their statement is binding. Collective success can therefore improve, stay unchanged or fall depending on the announced profile. A useful classroom question asks whether eliminating the difference between words and action solves the problem of choosing sufficiently ambitious words. Barrett and Dannenberg's work on credible commitments motivates that distinction; the classroom parameters and installment rule remain an original adaptation rather than a replication of their protocol.

4.2 Scientific uncertainty and risk

The uncertain-target treatment draws sixty or one hundred, each with probability one half, at the start of the block. The realization stays hidden until the outcome. Its mean is eighty, matching the known-target reference, but equal means do not imply equal success probabilities. A contribution total of eighty always succeeds under the known target and succeeds only half the time under the uncertain target. This contrast combines different target information with different protection probabilities at a given contribution. It should not be described as isolating a pure uncertainty effect while holding every material incentive constant.

At total eighty with symmetric contributions, each person retains twenty. Under the uncertain



Statement of intention

Block 1 / 1 · Extended

Position

4

Remaining wealth

40 ECU

Final target

80

Loss probability if the target is missed

75%

The statement will be visible to your group. It does not guarantee what others will do.

Your statement will be implemented automatically in four integer installments, spread as evenly as possible. You cannot reduce it afterward.

Available wealth: 40 ECU · Maximum per period: 10 ECU

Total pledge for this block

20

Continue

Figure 4.1: Review the total that will be implemented automatically.



Period information

Block 1 / 1 · Extended

Position

4

Remaining wealth

35 ECU

Final target

80

Loss probability if the target is missed

75%

Period 1 / 4

Automatic installment of your pledge

Position	Announced pledges	Cumulative contributions
1	20	5
2	20	5
3	20	5
4	20	5

Cumulative group contributions: 20 ECU

[Continue](#)

Figure 4.3: The implemented installment is not a new choice. Continuation 2/2.

target and baseline risk, expected payment before both uncertainties are resolved is one half times twenty plus one half times five, or twelve and one half. At total one hundred, each contributes twenty-five, retains fifteen and succeeds under either target. These comparisons show why caution can require more mitigation expenditure, yet do not prove that everybody will agree to pay for it. The additional five ECU per person buys protection against the high target while reducing wealth even if the low target was the one drawn.

Low-risk and high-risk treatments set the loss probability to one quarter and nine tenths. They retain the target of eighty and baseline resources. With zero effort, expected individual payoff is thirty in low risk, ten in the reference and four in high risk. The symmetric twenty contribution protects twenty in every case. At low risk, this symmetric profile is worse than universal zero effort in expected payoff, although a participant facing others' committed effort may still value being pivotal. Discuss both aggregate comparisons and individual deviations; calling twenty automatically efficient under every risk parameter would be a mistake.

At high risk, missing the target exposes much of the remaining wealth to expected loss, strengthening some incentives to coordinate. That is a theoretical comparison, not a guarantee of successful student cooperation. Risk attitudes, trust and expectations can alter decisions. A sample may also happen to experience no loss in a high-risk failed block. The probability parameter is known before choices; the realized event is known afterward. The report separates these objects so that the teacher can discuss decision quality under uncertainty without judging it solely by one favorable or unfavorable random outcome.

4.3 Wealth, vulnerability and redistribution

Unequal wealth assigns twenty, twenty, sixty and sixty ECU to positions one through four. Group wealth remains one hundred sixty. The respective period caps are five, five, fifteen and fifteen, making a proportional contribution path feasible. A proportional half-wealth profile contributes ten, ten, thirty and thirty across the block and reaches eighty. Equal absolute contributions of twenty each also reach eighty, but exhaust the two poorer positions. Compare effort shares and remaining wealth rather than using a single equality criterion. Different feasible allocations can achieve identical protection while producing very different distributions.

Unequal vulnerability keeps forty ECU and a ten-ECU cap for everybody. Positions one and two lose half their remaining wealth in the common event, while positions three and four lose all. The event is still common; it does not split into four independent risks. With zero effort and q equal to three quarters, expected wealth is twenty-five for the less exposed positions and ten for the more exposed positions. A difference in contribution can therefore reflect different material stakes with equal resources. Historical responsibility is not assigned by this treatment and should not be inferred from the position numbers.

The transfer treatment begins from unequal wealth and allows the funded sends described earlier. If both richer positions send ten to distinct poorer positions, available budgets become thirty for all four. Initial caps remain five, five, fifteen and fifteen. Those lower caps still allow each poorer position to contribute twenty, so an equal absolute effort profile can protect the group. Transfers need not occur, and receiving money imposes no contribution obligation. Compare this treatment with unequal wealth without transfers to study compensation and redistribution. Comparing it only with the symmetric baseline changes more than one resource rule at once.

A send of ten changes the sender and recipient budgets by opposite amounts. It does not increase the group contribution total until someone actually contributes, and it does not count as mitigation by itself. The sender can retain or contribute their remaining budget, while the recipient can retain or contribute the received amount within their cap. A group may redistribute without reaching the



Beginning of block

Block 1 / 1 · Extended

Position

2

Remaining wealth

40 ECU

Final target

60 or 100; hidden

Loss probability if the target is missed

75%

Position	Initial wealth	Maximum per period	Share of wealth lost in that event %
1	40	10	100
2	40	10	100
3	40	10	100
4	40	10	100

Wealth is restored at the beginning of another block. Blocks are independent and their payoffs are added. The group stays together throughout all four periods.

One block

Positions are internal group aliases, not countries or personal names.

[Continue](#)

Figure 4.4: Distinguish possible thresholds from the hidden realization.

target, or reach the target without redistributing. The empirical study by Tavoni and colleagues motivates discussion of inequality and coordination. This implementation isolates a direct transfer stage that should be identified as a pedagogical adaptation.

4.4 Clubs and productive access

In the open-access productive control, joining costs four and at least two members are needed for output. With two members, total output is twenty-four and every position receives six. With three, output is thirty-six and everybody receives nine. With four, everybody receives twelve. Nonmembers enjoy this output without paying its input fee. In the exclusive-club treatment, the same technology and participation threshold are used, but each member receives twelve and nonmembers receive zero. At any fixed membership profile, total output is the same in both configurations; only its allocation changes.

These controls separate productive access from collective protection. A nonmember can still benefit when contributions reach the climate target. The application cannot exclude someone from the common protection, but it can exclude them from the programmed productive benefit. Two members may make the productive activity profitable while leaving the mitigation target unmet. An instructor should therefore ask separately how many people joined, how much was contributed, whether the group was protected, and how output was distributed. Nordhaus's club argument motivates examining exclusion, while the four-ECU technology and protected terminal benefit are explicitly classroom choices.

Unlinked member access pays twelve to a member whenever at least two members joined, independently of contribution. Linked member access additionally requires that person to contribute twenty over the four periods. A member contributing nineteen receives no productive benefit; one contributing twenty qualifies. The foregone amount is destroyed and not redistributed to others. It does not enter the contribution pool, and no fine is deducted from remaining wealth. Compare these two member-access configurations to identify the incentive introduced by conditional access, keeping participation costs, productivity, target, exposure and threshold for production unchanged.

This linked rule is automatic and verifiable within the application. It is not an international tariff negotiation, an external sanctioning country or a model of strategic enforcement. Barrett and Dannenberg's trade-linkage study supplies the institutional question; its protocol is not replicated here. A full experiment on agreement adoption would need a separate choice over the institution and a specified voting rule. This family instead compares predefined access rules, so participants choose membership and contributions inside an institution selected by the instructor. Guides and discussion must preserve this distinction between an institutional comparison and endogenous treaty design.



Access decision

Block 1 / 1 · Extended

Position

4

Remaining wealth

40 ECU

Final target

80

Loss probability if the target is missed

75%

Joining costs 4 ECU from initial wealth. With at least two members, the activity converts each 4 ECU cost into 12 ECU of output. With fewer than two, there is no output and the cost is not refunded. The benefit is paid at the end and protected from the common loss.

Each member receives 12 ECU if there are at least two members and their contributions across all four periods reach at least 20. The benefit of a member contributing less than 20 is lost and not redistributed.

Would you like to join the productive activity?

Yes



Continue

Figure 4.5: Identify the access requirement before choosing.

Reading the private instructor report

5.1 Revelation and denominators

The report first shows participants, completed group blocks and pending group blocks. Decision aggregates remain hidden until the instructor presses Reveal aggregates. Hide aggregates restores the concealed view, and the choice is retained in that browser tab for the session. This is a display control inside the authenticated administration interface. It is not a claim that data are encrypted from the administrator. Participant routes do not expose the report. Before projecting, verify both that the correct session is open and that no participant-code listing remains visible in a neighboring panel.

Completed group blocks are the denominator for outcome counts. Four people per completed block form the denominator for individual contribution, wealth and payoff summaries. An announcement gap uses only people with an actual pledge in completed blocks. Period evolution uses groups that completed the specific period, even if their block is not yet finished. Therefore a partial session can show period-one effort while reporting zero completed blocks and no final payoffs. This is informative progress, not an inconsistency. Every table states its observation count so the teacher can identify which stage contributes to each metric.

The report collects active rounds explicitly from one through the configured number of blocks. It does not rely on the technical period from which oTree happens to open the report. A one-block session has ten technical subsessions because the application supports repeated configurations, but only its first block is active. Opening the administrative view from the last technical subsession must still count the first block's decisions. Synthetic checks include this case. The technical number should never be used to claim that students played ten encounters when the configuration provided only one.

Feedback script

Ask first what was decided, then whether the target was reached, and only then whether a loss occurred. Invite two explanations for the contribution pattern. Ask which observation would distinguish them, and close by identifying an inference that this classroom sample cannot support.

5.2 Outcome counts and contribution distribution

The outcome chart distinguishes target reached, failed with realized loss, and failed without realized loss. The last category is not cooperative success: the group missed its target and happened to retain wealth. With twenty independent failed groups under the baseline parameter, fifteen

Instructor report: treaties and global public goods

Basic · Baseline: nonbinding pledges · One block

Participants

4

Completed group blocks

1 / 1

Pending group blocks

0

Aggregates remain hidden until you choose to reveal them.

Reveal aggregates

Figure 5.1: Check progress before revealing aggregates.

Instructor report: treaties and global public goods

Basic · Baseline: nonbinding pledges · One block

Participants

4

Completed group blocks

0 / 1

Pending group blocks

1

Hide aggregates

Evolution within the block

Period	Observations	Contribution this period	Cumulative group contributions
1	1	5	20
2	0	—	—
3	0	—	—
4	0	—	—

Figure 5.2: Each completed period has its own denominator.

losses is an expectation, not a required realized count. In small samples, random variation can be substantial. If everybody succeeded, the absence of a loss does not provide evidence about risk preferences, because no loss draw was needed. Always begin by asking whether the target was reached before discussing the realized event.

The histogram counts individual contribution totals in fixed bins, rather than contributions in separate periods. Its observation count is four times the completed-block count. A repeated participant can therefore appear several times, once for each completed block. These entries are behavioral observations, not independent people. Histogram bars reveal whether an average hides a concentration at zero, an announced focal amount or substantial dispersion. Bins at ten-ECU intervals cannot establish an exact mass at a particular value inside a bin; use the export when that finer question matters.

An average contribution of twenty does not prove that every group reached eighty. One group can contribute one hundred twenty while another contributes forty, yielding the same mean group total as two exact-target groups. Because protection is nonlinear, their outcome and payoff comparisons differ. Calculate success at the group level first, then examine individual distributions. The report's largest within-group contribution difference summarizes burden dispersion without comparing people across unrelated groups. It is an absolute ECU measure; interpreting its size under unequal wealth requires considering initial wealth and contribution shares alongside it.

5.3 Evolution, positions and promises

The period table gives the number of eligible group blocks, mean individual contribution in that period and mean cumulative group effort. A growing mean cumulative total is mechanically expected when contributions are nonnegative. Learning should not be inferred from that increase alone. Instead examine period contributions, the remaining feasible gap and the previously displayed information. A late spike can be a rescue response. A flat path can be a planned equal installment strategy. With incomplete groups, the eligible sample can change between rows, so even within-period comparisons require attention to the stated denominators.

The position table separates wealth, contributions and payments for the four public positions. Under asymmetric treatments these positions represent resource or exposure profiles. Under symmetric basic groups they are arbitrary aliases. In reassigned encounters, a person can occupy different positions, making the table unsuitable as a personal longitudinal record. The between-block table reports completed groups, average total contribution and the number reaching the target in each block. Comparing fixed and reassigned sessions requires similar block horizons and disclosure conditions; their raw accumulated payment totals are incomparable if one session contains more active blocks.

The average signed promise gap can conceal offsetting deviations. Suppose two people underfulfill by ten and two overfulfill by ten. The mean gap is zero, but none fulfills exactly. Use the individual export for absolute deviations or exact compliance rates when needed. In the binding treatment, installments guarantee equality between pledge and contribution, so the gap carries little information beyond verification of execution. The teacher should turn instead to pledge levels, target attainment and retained wealth. No-pledge sessions correctly show a missing gap summary rather than implying universally fulfilled promises.

Membership summaries show members meeting the twenty-ECU requirement and total members. This is a descriptive count even when the selected institution does not impose that requirement. Transfers are reported as ECU actually sent in complete blocks. Neither statistic alone measures welfare. A group with high membership can still spend too much on mitigation, and transfer volume can circulate budgets without increasing protection. Present the mechanism, relevant

Instructor report: treaties and global public goods

Basic · Baseline: nonbinding pledges · One block

Participants

4

Completed group blocks

1 / 1

Pending group blocks

0

Hide aggregates

Observations: 4 · Contribution minus pledge n: 4

Total contribution per person

20

Remaining wealth per person

20

Payoff per person

20

Contribution minus pledge

0

Largest within-group contribution difference: 0 ECU

Collective outcomes

Observations: 1

Target reached		1
The loss event occurred		0
No loss occurred		0

Figure 5.3: Interpret each measure using its denominator.

Distribution of individual total contributions

Observations: 4

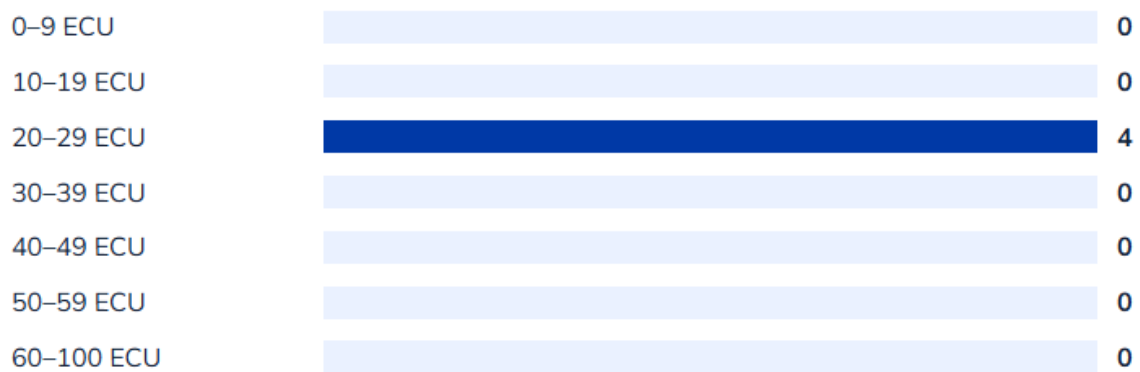


Figure 5.4: Read individual totals from completed blocks.

choices and resulting accounting together. This approach helps students see why institutions affect incentives through specific constraints and benefits rather than through their names.

Evolution within the block

Period	Observations	Contribution this period	Cumulative group contributions
1	1	5	20
2	1	5	40
3	1	5	60
4	1	5	80

Distribution by position

Position	Observations	Initial wealth	Total contribution per person	Payoff per person
1	1	40	20	20
2	1	40	20	20
3	1	40	20	20
4	1	40	20	20

Comparison across blocks

Block	Observations	Cumulative group contributions	Target reached
1	1	80	1

Payoffs, pledges and distributions use completed blocks only: four people per block. Period evolution includes groups that completed that period, even in unfinished blocks; each row displays its denominator. A realized loss is not interpreted as a decision. Individual codes must never be projected.

Figure 5.5: Relate evolution and positions to eligible groups.

Teaching and exercises

6.1 A usable class sequence

For a first lesson, allocate a short opening to public goods and common risk without announcing a preferred contribution. Allow students to read instructions and pass comprehension privately. Keep the room quiet during choices. While they play, observe completion status rather than individual choices. If a group is stalled, contact the relevant participant privately and diagnose a technical or comprehension problem. Do not announce the current funding gap to the whole class unless it is part of the displayed feedback. Extra instructor information can alter the treatment and undermine the intended comparison.

After all groups finish, ask students to predict the contribution distribution before revealing it. Record competing predictions on a board. Reveal the report and discuss completed groups, average effort, dispersion and collective outcomes in that order. Then reconstruct one exact-target example and one failed example with the baseline equations. If an extension was run, identify its single institutional or informational change before comparing results. End by asking how coordination, cost allocation and enforceability appear in an international agreement. Keep the connection conceptual: the classroom task has no emissions inventory, national government or actual climate damage.

For a more advanced class, compare unequal wealth with funded transfers or unlinked with linked productive access. Give each group a written accounting problem afterward, using anonymous hypothetical profiles rather than a named student's choices. Ask for both a payoff calculation and an interpretation. A correct calculation is necessary but insufficient for explaining behavior; a plausible interpretation is insufficient if it ignores the budget. This combination encourages students to tie institutional claims to a transparent mechanism. Longer ten-block configurations support discussion of history and group continuity, but require more time than a single four-period demonstration.

6.2 Research foundations and limits of the adaptation

Milinski and colleagues introduced an experimental collective-risk dilemma in which successive contributions aim to prevent a possible loss of remaining resources. Their study makes risk and target attainment central to cooperation. The present four-person, four-period parameters, integer menus and reference loss probability are classroom adaptations. The paper does not supply a quantitative prediction for this exact menu. Use it to motivate why the activity differs from a public-goods game with refunded failed contributions or a constant marginal return, while retaining the implementation's own accounting as the source of its numerical examples.

Barrett and Dannenberg studied climate negotiations under scientific uncertainty and emphasized

how the location of a dangerous threshold affects cooperation. Tavoni and colleagues examined inequality and communication in a collective-risk setting, finding that communication improved coordination in their design. Nordhaus developed an international climate-club argument based on incentives and exclusion. Barrett and Dannenberg later analyzed trade linkage and the credibility of commitments. These works motivate the selected mechanisms; their estimates should not be imported as expected classroom effect sizes. The package is not a reproduction of any single published experimental protocol.

The available observations can illustrate whether a specific group funded a target, whether announcements matched choices and how budgets were distributed. They cannot establish the effectiveness of an actual environmental treaty, estimate national climate preferences or prove that a given institutional design is globally optimal. Participation is a classroom activity with limited sample size, possible peer familiarity and no default monetary conversion. Describe these features when relating the exercise to evidence. Demographic questions are absent because the learning objective does not require personal information. Adding a research purpose would require a separately specified protocol and appropriate procedures.

6.3 Exercise: exact protection and a missed target

Four equal actors contribute five per period. Compute individual total, group total, remaining wealth and payment. Each contributes twenty, the group reaches eighty, and each receives twenty with no loss draw. Now suppose the fourth actor contributes four in every period while the other three still contribute five. The group total is seventy-six. The first three retain twenty each and the fourth retains twenty-four. If the common draw is below three quarters, all four receive zero. Otherwise they receive their respective remaining wealth. Their expected payments are five, five, five and six.

The expected sum in the second profile is twenty-one, while the successful profile pays eighty. The fourth actor retained four additional ECU before risk but exposed the whole group to failure. This comparison is not a unilateral one-ECU deviation in the final period; it changes four contribution decisions and may also change others' responses in a live sequence. Ask students to identify what was held fixed in the calculation. The answer is the other actors' contributions, the target, risk and wealth. The calculation evaluates hypothetical profiles, rather than predicting that everyone would behave the same way after observing reduced early effort.

6.4 Exercise: feasible rescue and unequal resources

After three periods a group has contributed fifty-five. With four caps of ten, the fourth period can add at most forty. The remaining gap is twenty-five, so protection is feasible. If one actor has only two ECU left and the others have at least ten, the funded aggregate maximum is thirty-two, still sufficient. Now change accumulated effort to forty-five with the same remaining budgets. The gap is thirty-five and only thirty-two is feasible. The target cannot be reached, even though the sum of nominal period caps is forty. Remaining funded wealth matters separately from the nominal cap.

In unequal wealth, the profile ten, ten, thirty and thirty reaches eighty and leaves ten, ten, thirty and thirty. All actors contribute half their initial wealth. The alternative twenty, twenty, twenty and twenty reaches the same target but leaves zero, zero, forty and forty. Both generate group payment eighty. They differ in distribution, not aggregate protection or total cost. An instructor can ask whether an equal absolute burden is preferable to an equal proportional burden, but should not label one mechanically more efficient on this criterion. The report's position table helps students substantiate their chosen fairness principle.

6.5 Exercise: uncertainty and productive access

Under an uncertain target of sixty or one hundred, calculate protection at group effort eighty. It occurs only for the low target. If equal contributions leave twenty each, expected payment before both lotteries is twelve and one half at the reference loss probability. At group effort one hundred, each retains fifteen and protection is certain. This comparison assumes symmetric allocations and risk-neutral evaluation. It does not imply that the extra effort is privately attractive for every unilateral deviation. Ask students to separate the collective expected payoff comparison from the question of who is willing to provide the extra twenty.

Two actors join a productive activity. They pay four each, creating twenty-four of output if the two-member condition is met. Under open access, all four receive six. Under exclusive access, the two members receive twelve each and the other two zero. If the target fails and a full wealth loss occurs, protected output still pays these amounts. Contributions and fees have already been spent. This is why one must not add a lost wealth payment to the gross output and then subtract the fee a second time. The fee belongs in available wealth from the beginning, not as a second terminal charge.

With linked access, suppose the two members contribute nineteen and twenty over the block. Only the second qualifies for twelve. The other twelve of potential output is forfeited. There is no transfer to the complying member and no deduction of twelve from the noncomplier's remaining wealth. Under unlinked access both members receive twelve. Ask what happens if a participant instead joins and contributes twenty-one: the benefit stays twelve, so the extra contribution changes wealth and possibly protection, not the access reward. The exact boundary at twenty is a property of this adaptation and can create a visible focal amount.

Data, troubleshooting and operational closure

7.1 Export and reproducibility

The custom export provides session, configuration, language and treatment, participant code, block, group and position, public wealth and exposure, transfers, membership fee, available budget, pledge, four contributions, remaining wealth, productive benefit, target, group total, completion, success, loss, stored draw, loss probability and expected and realized payment. Participant codes are useful for private longitudinal reconstruction but must not be projected or combined with classroom names. Standard oTree exports can also contain technical inactive rounds. The custom export includes active blocks and explicitly records whether they have finished, allowing incomplete records to be identified.

For each completed group block, reconstruct available wealth, check the four contribution sums, compare the group total with its realized target, and apply the common event once. Verify that transfers sent equal transfers received across the group, and distinguish generated output from preexisting wealth. Check that a successful group has no loss draw and that reopening a result preserves the event. Repeated sessions sum realized block payoffs and reset wealth between blocks. These checks make outcomes auditable without assuming that an attractive chart proves the accounting was correct. They also identify the proper observation unit for later descriptive tables.

Technical evidence in this package is organized by distinct branch rather than by every translated configuration. Representative bots exercise each institution, the fixed and reassigned modes, invalid budgets, waits and closure. Independent numerical cases cover target boundaries, partial exposure and membership profiles. Browser checks cover English and Spanish common routes, unique transfer and automatic-commitment screens, private report revelation and isolated room selection. This strategy avoids repeated complete sessions for identical logic while retaining evidence for every implemented mechanism. It is appropriate for a new family; a later migration or registration-changing deployment may require broader configuration checks.

7.2 Diagnosing common problems

If someone remains on a wait page, check whether all four real seats have reached the same stage. A person who has not accepted the rules or corrected comprehension can hold the group earlier in the sequence. A closed tab should be reopened using that person's original link. Do not create a new participant to replace the closed tab inside an already formed group. If a browser refresh occurs, the stored choice and event should remain unchanged. Report the issue and its stage privately. The local instance should be restarted only after identifying its own process; other game

servers must remain running.

If a contribution is rejected, compare the requested number with both the displayed cap and remaining wealth. A transferred amount does not increase a poor position's initial cap. If a pledge is rejected, check four-period capacity and available budget after membership or transfers. If output is zero, first check the two-member production condition, then the applicable access and contribution rules. If the report shows no payments, determine whether any group block has finished. Period feedback is not a terminal payment. Missing averages are displayed as a dash rather than fabricated zero observations.

An unexpected public route can reflect a deployment or domain issue even when local tests passed. Consult laboratory coordination and preserve existing session data. Restarting the server does not require resetting the database. A reset would invalidate participant links and erase local sessions; it must never be used merely to refresh templates. The launcher creates a new family database only when none exists and refuses initialization of an existing one. Localhost is accessible only on the same computer, so students on other machines need the laboratory deployment or an explicitly prepared network arrangement, not a copied localhost link.

Attention

Do not reset a database to refresh code or repair a stalled participant. Preserve the original links and stored common event. A successful local run, a Git commit, a public deployment and a classroom pilot are separate milestones.

7.3 Closing the lesson and planning a pilot

Before ending class, ask every group to write one mechanism statement tied to an observed or hypothetical profile. A strong statement identifies resources, the changed institution, a predicted choice margin and the report measure that would reveal it. For example, conditional member access changes the private payoff at a twenty-ECU contribution total, whereas an ordinary promise does not directly alter the payment formula. Invite students to identify a possible confound and a missing observation. This closes the lesson with disciplined reasoning instead of a ranking of groups by cooperation or moral worth.

For the first real pilot, record time spent reading, comprehension difficulties, wait-page incidents, chosen treatment and duration of discussion. Do not record personal traits by default. Ask whether the tables and screenshots were legible when projected and whether students distinguished common loss from separate risks. Document any deviations from the intended instructions, such as extra instructor reminders. The package can be technically verified and ready for a pilot before these observations exist. Its estimated duration should remain labeled as an estimate until the pilot supplies actual evidence. Publication does not substitute for such a classroom check.

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