



Instructor Guide to Collective Action

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 coordination and collective action 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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Preparation and access

1.1 Family summary

Purpose	Analyze coordination, thresholds, costs and information in producing a collective outcome.
Experimental unit	Six members; seven people when A chooses a removal.
Basic edition	One interaction, ten fixed-group rounds or ten rematched rounds.
Extended edition	Twelve eight-round configurations: reference and variants on thresholds, information, costs, sequence, announcements and removal.
Decision	Participate or not; announce an intention when applicable; A chooses removal zero or four ECU.
Payoff	Endowment 10 ECU; cost 3 and bonus 8 in the reference. Removal: reversal without a bonus. Resources renew each round.
Topics	collective action; participation thresholds; coordination; private and public information; leadership; collective resistance
JEL	A22; C72; C92; D72; D83
Participants	Multiples of six or seven by treatment; rematching requires two complete groups.
Suggested duration	30–45 minutes; estimate to be checked in a classroom pilot.

1.2 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.

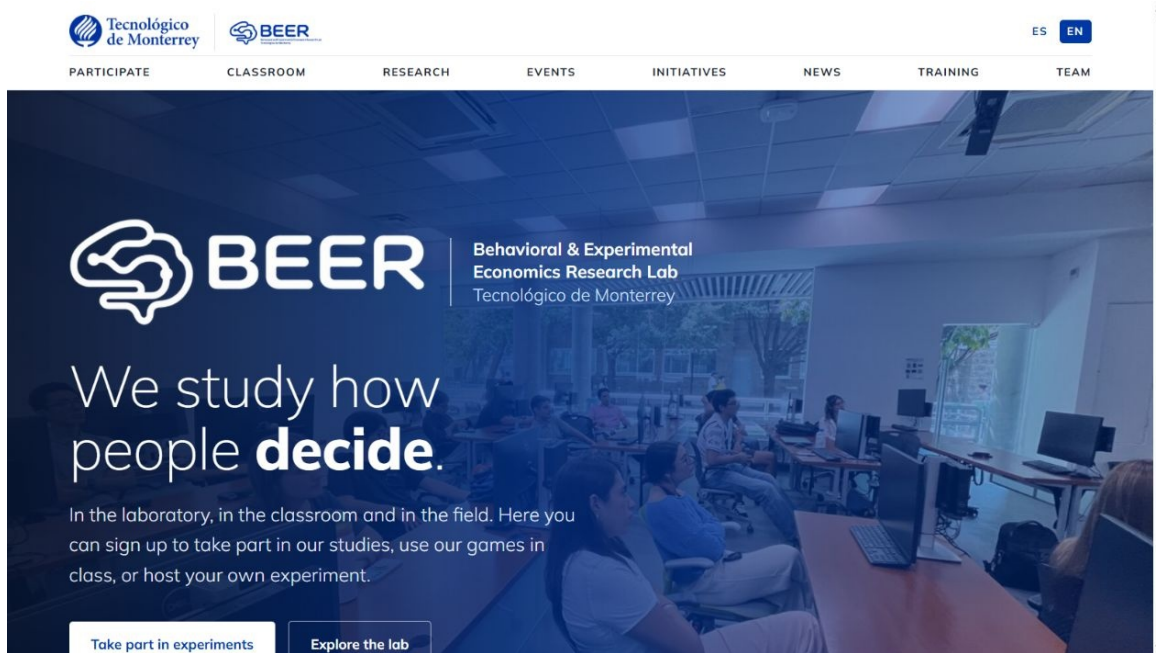


Figure 1.1: Institutional access: select CLASSROOM.

1.3 Starting at the laboratory website

Open <https://beer-lab.org/> and enter the directory at <https://teaching.beer-lab.org/en/>. Select Coordination and Collective Action. The proposed institutional address is <https://collectiveaction.beer-lab.org/>. Instructors enter at <https://collectiveaction.beer-lab.org/demo>; students use a room such as https://collectiveaction.beer-lab.org/room/collective_action_en. These routes guide laboratory deployment; their inclusion does not establish that the hostname has already been published.

To inspect the package before deployment, use <http://localhost:8101/demo>. The local instance has its own database and displays only this family. Localhost works on the computer running the server; typing it on another computer refers to that second computer's local address. For a classroom session, distribute the institutional participant link confirmed by laboratory staff. A successful page load on the instructor's computer does not prove that other workstations can reach it.

Demo opens a demonstration and provides links for all people in the same session. Do not distribute Demo to students: they might open separate sessions and wait indefinitely for participants who never join their groups. Open the room assigned to the intended session and share that link or its QR code. Keep administrative access on the instructor's computer and project only material intended for classroom discussion.

The basic room is https://collectiveaction.beer-lab.org/room/collective_action_en.

The four rooms are https://collectiveaction.beer-lab.org/room/movilizacion_es, https://collectiveaction.beer-lab.org/room/collective_action_en, https://collectiveaction.beer-lab.org/room/movilizacion_extendido, https://collectiveaction.beer-lab.org/room/collective_action_extended.

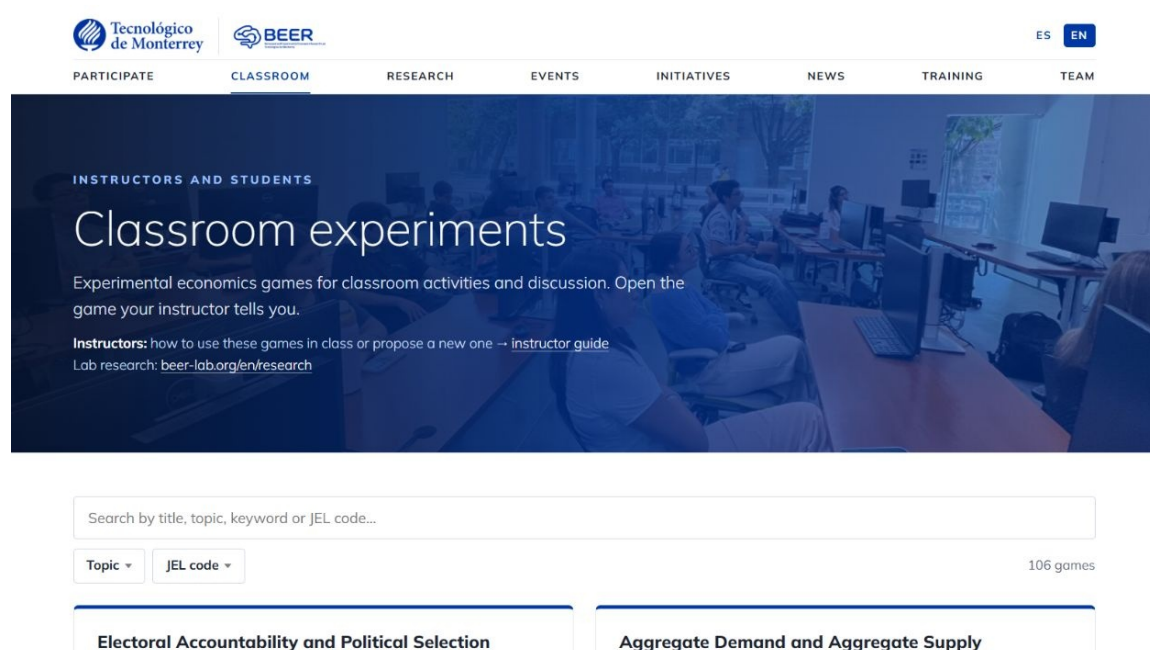


Figure 1.2: Current teaching catalog: choose language and edition on the family card.

1.4 Rooms, attendance and configurations

There are thirty configurations, fifteen per language. Each basic room contains three and each extended room twelve. Basic groups have six members: twenty-four students form four groups. Removal requires seven: twenty-eight students form four groups. Rematching needs at least two complete groups, so six or seven people are insufficient for that mode. Create the session using final attendance and give remaining students an observation task outside the session rather than occupying places they cannot complete. Do not have a student operate two roles during class.

Checkpoint

Check family, language, edition, treatment, horizon and attendance. Demo must show thirty configurations of this family, and Rooms exactly its four rooms. A basic room starts with one round and excludes extensions.

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.

oTree
Demo
Sessions
Rooms
Data
Server Check
Logout

Demo

Coordinación y movilización colectiva · Una ronda
Coordinación y movilización colectiva · Diez rondas, grupo fijo
Coordinación y movilización colectiva · Diez rondas, reasignación
Coordinación y movilización colectiva — Extendido · Referencia
Coordinación y movilización colectiva — Extendido · Número requerido: dos
Coordinación y movilización colectiva — Extendido · Número requerido: cinco
Coordinación y movilización colectiva — Extendido · Número incierto y señales privadas
Coordinación y movilización colectiva — Extendido · Señales privadas y señal común
Coordinación y movilización colectiva — Extendido · Costos heterogéneos privados
Coordinación y movilización colectiva — Extendido · Costos heterogéneos públicos
Coordinación y movilización colectiva — Extendido · Primera decisión visible
Coordinación y movilización colectiva — Extendido · Retiro y reversión colectiva
Coordinación y movilización colectiva — Extendido · Retiro con número incierto
Coordinación y movilización colectiva — Extendido · Retiro con señales privadas
Coordinación y movilización colectiva — Extendido · Anuncios no vinculantes
Coordination and Collective Action · One round
Coordination and Collective Action · Ten rounds, fixed group
Coordination and Collective Action · Ten rounds, rematching
Coordination and Collective Action — Extended · Reference
Coordination and Collective Action — Extended · Required number: two
Coordination and Collective Action — Extended · Required number: five
Coordination and Collective Action — Extended · Uncertain number and private signals
Coordination and Collective Action — Extended · Private signals and common signal
Coordination and Collective Action — Extended · Private heterogeneous costs
Coordination and Collective Action — Extended · Public heterogeneous costs
Coordination and Collective Action — Extended · Visible first decision
Coordination and Collective Action — Extended · Removal and collective reversal
Coordination and Collective Action — Extended · Removal with uncertain number
Coordination and Collective Action — Extended · Removal with private signals
Coordination and Collective Action — Extended · Nonbinding announcements

Coordinación y movilización colectiva / Coordination and Collective Action — BEER Lab

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

Figure 1.3: Family-only Demo: choose the mode before creating individual access links.

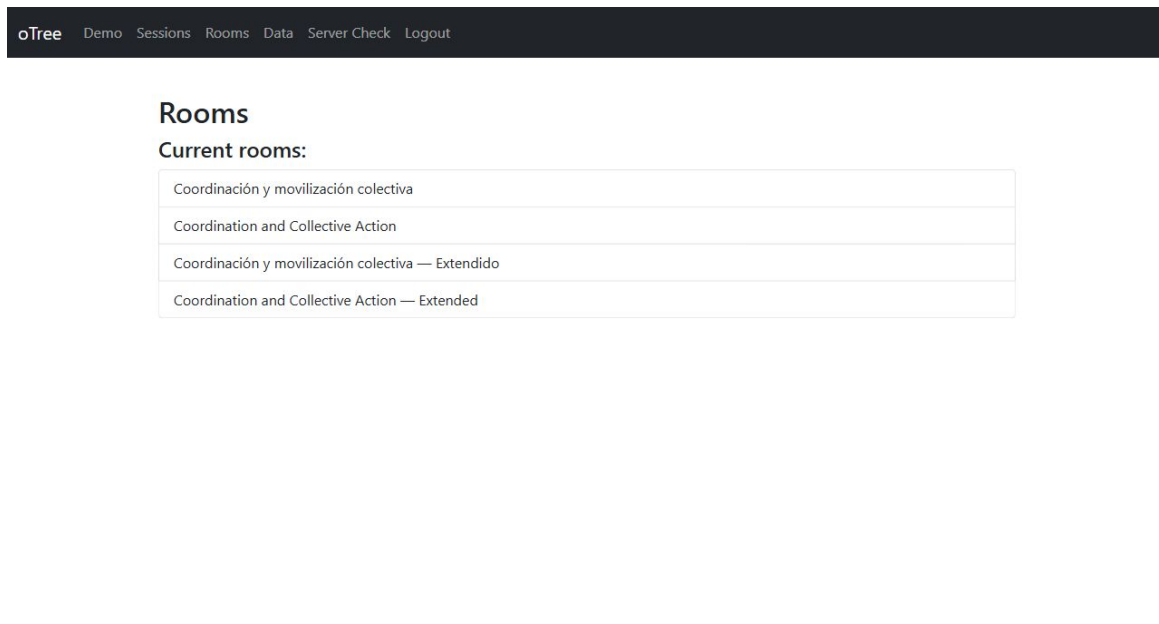


Figure 1.4: Four rooms without configurations belonging to other families.

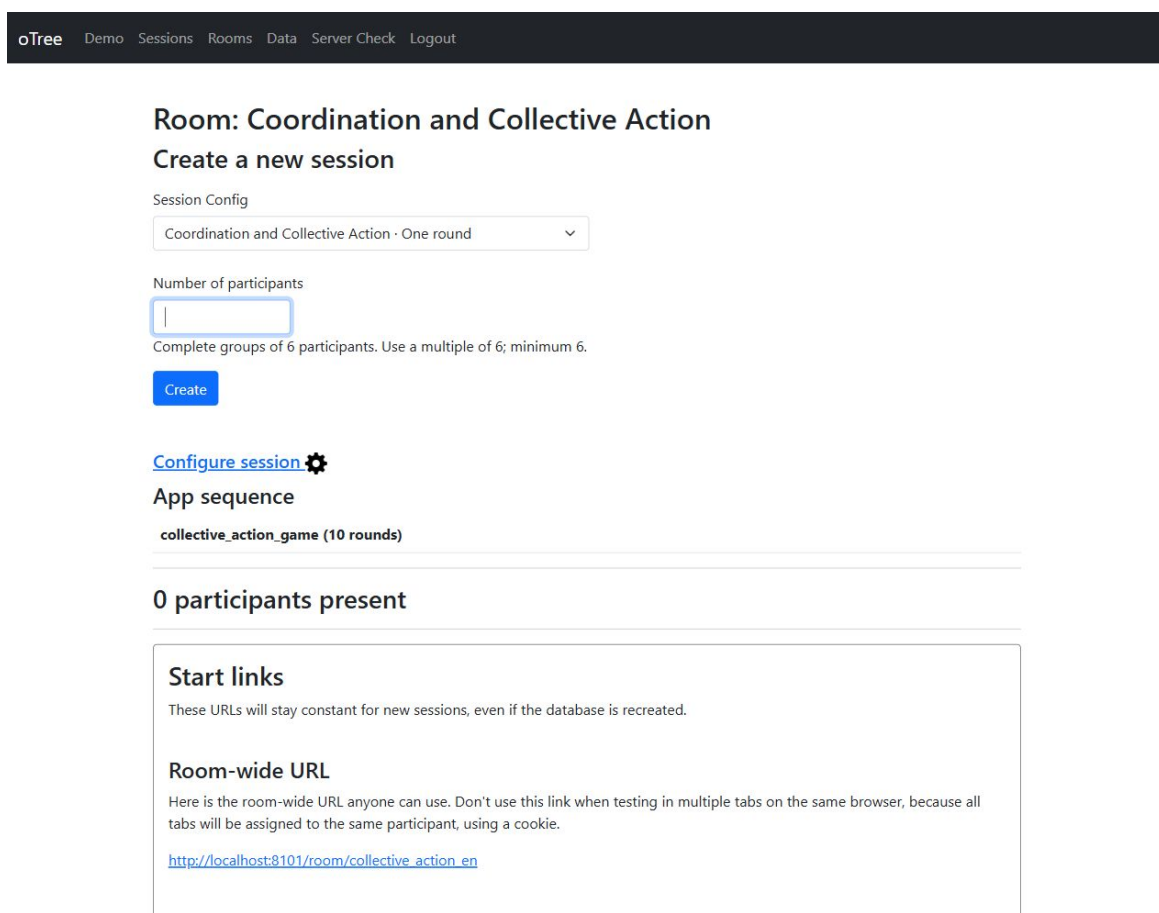


Figure 1.5: Basic-room form: confirm language, participant count and configuration.

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.

1.5 Preparing before students arrive

Test one tab per person. The reference waits for six actions; removal first waits for A and then for six members; leadership waits for the first action before displaying it to the other five. Announcements waits for six messages and then six decisions. Keeping a tab open does not complete a stage.

Inspect instructions, comprehension, results, and the closing screen in the selected language. Keep the report hidden and check how to reveal it afterwards. Prepare a short explanation of ECU: these are experimental units, and the guide does not promise monetary conversion or external payments. If the laboratory uses real incentives, announce the payment rule before the first decision and keep it constant across treatments intended for comparison. Do not introduce a different incentive scheme after seeing outcomes.

Establish a procedure for individual questions. Ask students to raise a hand and provide private assistance without recommending participation, nonparticipation, or a particular transfer. Technical help explains controls and rules. Strategic advice changes the exercise. Prepare an incident record for interrupted connections, late arrivals, or misunderstandings that persist after comprehension checks. Such information supports a more accurate interpretation of incomplete groups and unusual choices.

1.6 Demonstration scope and distributing access

In the removal version, a demonstration teaches the sequence; it does not provide evidence about students' behavior when the instructor entered all choices in multiple tabs. When opening it, retain the session name and inspect individual links. Roles are randomized during group formation, so the first link is not necessarily the person A. Check the role on the round-opening screen before looking for a removal form. A member tab waiting for the person A can be operating correctly rather than missing its own decision control.

During testing, give tabs private labels so you remember which link you operate. This organization should not appear in public projection or be inserted into participant instructions. After submitting a removal, check that the six screens in that group advance. Another group can remain waiting because its own person A has not finished. Groups synchronize with their own members; one person A's decision does not automatically release the entire session. This is particularly useful to understand when reviewing a twelve-link demonstration alone.

For class, create the session with the final attendance and verify its association with the room. Check the room form: the selected configuration should match the language and edition announced to students. Open a participant test access only if you can complete its role or staff have arranged that trial; occupying a place and abandoning it leaves a pending decision. Distribute access after

completing the administrative check, rather than asking students to diagnose an unassigned room themselves.

Do not share instructor passwords or a screen of administrative links as a way to allocate participants. The room is the intended student entry point, while the report requires instructor authorization. When asking a colleague to test, provide the relevant role or access and explain whether it is practice or a classroom session. This keeps data and screenshots interpretable and separates intended demonstrations from sessions accidentally opened during preparation. Record which session will supply the results used in feedback.

For the instructor

Create a new classroom session, associate it with the intended room, and verify participant access. Separate practice demonstrations from the session you will analyze. Do not reuse old participant links after a database change or reset the database to refresh a screen.

Rules and participant experience

2.1 Decision, resources and accounts

An activity can benefit everybody and still fail to take place. The problem is not confined to people who prefer to rely on others' effort: it also arises when each member is willing to participate only if enough others do so. This family makes that distinction visible through a simple decision. Six members privately choose whether to participate without seeing others' simultaneous choices. Success requires a minimum number, and participation always has a cost. The exercise can illustrate a student initiative, citizen mobilization or a collective service without eliciting real partisan preferences.

Every member starts each round with 10 ECU. ECU means Experimental Currency Units. It is neither a physical token nor a national currency, and it is not a promise of a cash payment. Participation costs 3 ECU in the reference. If at least four members participate, every member receives an additional 8 ECU, including those who did not participate. Below four, nobody receives that bonus; participating members still incur the cost. Resources renew in each round, and earlier earnings do not finance the next decision. The cumulative outcome summarizes earnings but is not a budget available to spend.

Let a_i denote member i 's action: one for participation and zero otherwise. Let k denote the sum of the six actions and T the required number. Individual earnings equal ten minus three times a_i , plus eight whenever k reaches T . The reference uses T equal to four. These symbols describe the announced monetary rule; they do not incorporate altruism, reputation or political preferences. The decision is binary: members do not choose a contribution amount and cannot compensate for another person's absence by paying more. That distinction separates this family from continuous-contribution public goods.

Consider four participating members and two nonparticipants. Each participating member earns ten minus three plus eight, or 15 ECU. Each nonparticipant earns 10. The group earns 96 ECU: initial endowments sum to 60, four participation costs subtract 12, and six bonuses add 48. With three participating members, they earn 7 each and the other three earn 10. Total earnings equal 51. A fourth participation raises total earnings by 45: it creates 48 of collective benefit and consumes three in cost. This account distinguishes the individual cost from the joint gain.

2.2 Outcomes and additional roles

The result screen shows participation count, required number, whether it was reached and own earnings. It does not identify who chose which action. Under uncertain requirements, the actual number is revealed only after decisions close. The final screen confirms completion and asks students to wait for the instructor. It has no button leading to technical end pages and does

not require opening another game. In ten-round sessions, completing a round opens the next interaction; completing round ten opens the final screen. Spanish and English preserve the same decision logic.

Before projecting results, ask students to reconstruct two accounts. First, a member participates when only two others participate: earnings are seven. Second, a member does not participate when four others already do: earnings are eighteen. Ask what would happen if that person changed their own action while keeping the other five unchanged. This introduces the mechanism through payoff differences before vocabulary such as equilibrium or pivotality. Avoid asking somebody to disclose their actual choice publicly: hypothetical cases can teach the account without identifying students.

Removal variants introduce person A and change the payment rule. There are seven people: A and six members. A starts with 10 ECU and chooses to remove zero or four ECU from each member. Reaching the required number reverses removal for everybody. Otherwise A retains the removed resources. These variants have no additional eight-ECU bonus. A does not make a participation decision and is not included in the six-member participation denominator. Instructions announce this explicitly so students do not add reversal and a bonus as two separate benefits.

With removal four and four participants, A earns ten, participating members earn seven and nonparticipants earn ten. Total earnings are 58: the seven initial accounts sum to 70 and four costs consume twelve. With only three participants, A earns 34, participating members earn three and nonparticipants earn six. Total earnings are 61. Removal is an internal transfer in both cases; participation consumes resources. Reversal changes distribution without creating a new resource. This difference from the reference bonus must precede a comparison of welfare across institutions.

2.3 Comprehension and individual support

The comprehension question about benefit recipients explicitly refers to the reference. Under removal, the corresponding distributive rule is reversal for everybody. A checks the members' rules despite not making that choice. Under heterogeneous costs, each member must answer using their actual first-round cost. Feedback identifies the submitted answer, the correct answer and the relevant rule. Correcting comprehension does not reduce earnings or reveal a recommended strategy. Instructors should clarify the account when a student is mistaken without advising which action to choose.

$$\pi_i = 10 - 3a_i + 8 \mathbf{1}\left\{\sum_{j=1}^6 a_j \geq T\right\}, \quad a_i \in \{0, 1\}.$$

What participants will see

Screens use neutral role names. Choice is individual and private; only the group outcome and own payoff are revealed afterwards. Discuss the theoretical purpose once the block has ended.



Welcome to the BEER Lab

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

Read the rules and decide privately. We will discuss aggregate results afterwards.

Laboratory rules

- Remain quiet and do not talk to other participants.
- Use only the communication enabled on screen.
- Do not close or refresh the page.
- Raise your hand if you need help.

☐ I have read the laboratory rules.

Start

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Figure 2.1: Welcome and rules

BEER Lab · Round 1 of 1

Instructions

Your role: Member

Resources and unit of account

Every member starts each round with 10 ECU; resources renew.

If the required number is reached, every member receives an additional 8 ECU, including those who did not participate.

Participating costs you 3 ECU, even if the required number is not reached.

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

This session does not convert ECU into real money.

At least 4 of the six members must participate.

The group remains the same throughout the session.

Reference example: with four participants, a participating member receives $10 - 3 + 8 = 15$ ECU and a nonparticipant receives $10 + 8 = 18$ ECU. With three participants they receive 7 and 10 ECU, respectively.

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Figure 2.2: Instructions with explicit resources



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

BEER Lab

Check the rules

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.

How many members can participate?

Your answer: 5. The correct answer is 6. Six members always make participation decisions. In the version with A, one additional person chooses the removal.

What is your participation cost in this round? (ECU)

In the reference, who receives the benefit when the required number is reached?

- ☒ Every member
☐ Only participating members

Continue

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Figure 2.3: Feedback on an incorrect answer; valid answers are retained



BEER Lab · Round 1 of 1

Your decision

Your role: Member

Your resources and payoff rules

Every member starts each round with 10 ECU. ECU means Experimental Currency Units. These resources renew each round. No conversion to cash is specified here.

If the required number is reached, every member receives an additional 8 ECU, including those who did not participate.

Participating costs you 3 ECU, even if the required number is not reached.

At least 4 of the six members must participate.

Your decision

- ☐ Participate
- ☐ Do not participate

Continue

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

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Figure 2.4: Individual binary choice

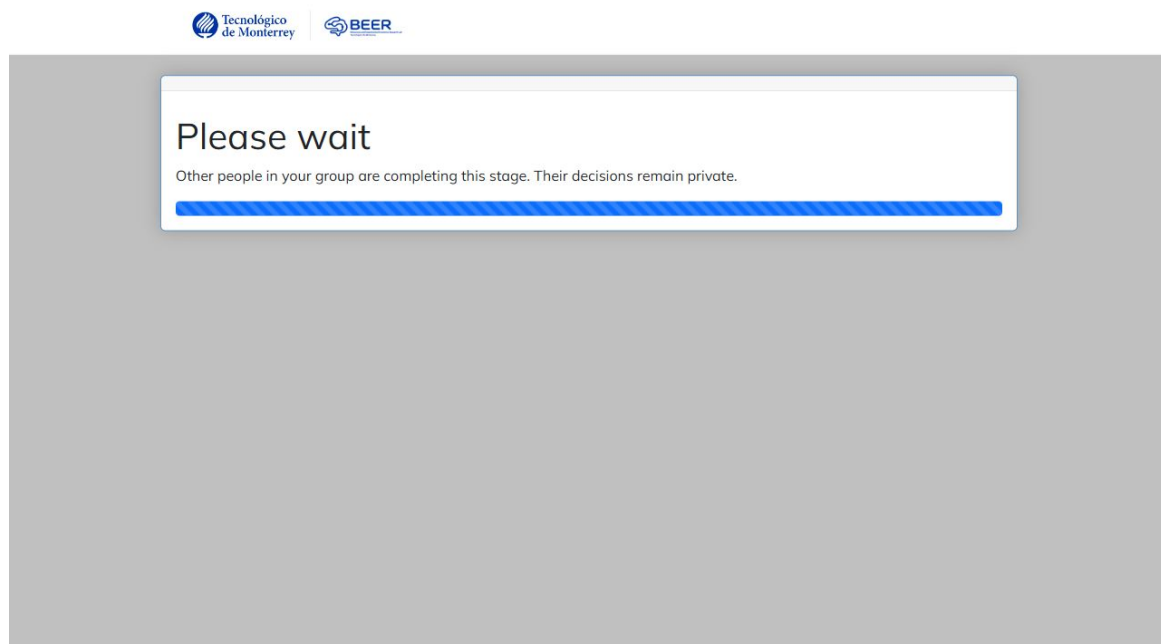


Figure 2.5: Waiting for required decisions

BEER Lab · Round 1 of 1

Round result

Members who participated	Required number	Your outcome
4 / 6	4	15.00 ECU

The required number was reached: **Yes**

Continue

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

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Figure 2.6: Round outcome



Activity completed

Your decisions have been recorded. Remain quiet and wait for the instructor.

Cumulative outcome

15.00 ECU

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

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Figure 2.7: Explicit activity closure

Theory and predictions

3.1 Equilibrium, coordination and efficiency

A Nash equilibrium is a combination of decisions in which nobody increases their payoff by changing alone, taking the other people's decisions as given. The definition compares alternatives; students need not know its name when playing. It does not establish that an equilibrium is fair, efficient or morally desirable. Teaching this family works best by checking concrete deviations before introducing the label. A material benchmark assumes participants care only about their own ECU payoff and understand the rule correctly. When those assumptions do not hold, behavior can differ without representing a technical error.

There is a reference equilibrium in which nobody participates. A person acting alone cannot reach four and loses three ECU. The remaining five can stay out. Everybody might prefer collective success, but one unilateral change cannot produce it. Discuss an initiative in which all members express interest while each waits for somebody else to take the first step. The model does not require indifference to the shared benefit; it requires that an isolated action be insufficient to provide it. This is a coordination issue as well as a potential free-rider problem.

There are also equilibria with exactly four participants. Each of those four is pivotal: withdrawing reduces total participation to three and own earnings from fifteen to ten. A nonparticipant joining would preserve success but reduce own earnings from eighteen to fifteen. Nobody gains by changing alone. There are fifteen ways to select four people from six, in addition to the no-participation equilibrium. The material model therefore contains sixteen pure profiles, rather than a prediction that one unique profile must occur or an assignment of which particular students should bear the cost.

Five or six successful participations are not pure material equilibria. A member can leave while preserving success and save the cost. One, two or three participations are not pure material equilibria of the reference either: someone already participating can leave and save three without losing a bonus that was not being earned. Those statements hold the other actions constant. A member who thinks their conduct changes later decisions, values cooperative norms or anticipates sanctions outside the model is considering something different from this static comparison. An instructor should state the assumptions rather than calling that person's choice irrational.

Efficiency compares the sums of possible payoffs. At threshold four, success with four participants maximizes total earnings among successful profiles: 96 ECU. Success with five yields 93 and with six yields 90. Additional participation creates no further benefit once the threshold has been reached. Maximum joint earnings do not resolve the distributional conflict: under success, nonparticipants earn more than participants. Classes can therefore discuss efficiency, assignment of costs and willingness to sustain collective activity together. Do not reduce those distinct questions to one cooperation rate or treat a high participation count as automatically better for everybody.

3.2 Pivotality and expected incentives

Ex post pivotality asks whether changing one action, with the other five fixed, changes collective success. With exactly four participants, their four affirmative actions are pivotal and the two negative actions are not. With three participants, the three negative actions are pivotal under the counterfactual of joining; the three affirmative actions are not. At zero or six participants, no unilateral action change switches the outcome. The report counts pivotal actions out of six decisions per completed group. It does not establish that anybody knew they would be pivotal or intended to help the group.

Expected incentives concern the decision before others' actions are known. With cost three and benefit eight, participation is materially attractive when the probability that exactly three of the other five participate exceeds three eighths. The expected difference between acting and not acting is eight times that probability minus three. This calculation uses risk neutrality and holds beliefs about the others constant. The group's overall probability of success is a different object: it may be high because many people will already act, making one further participation unable to change the outcome.

If the other five actions are independent and each occurs with probability p , the probability of exactly three equals ten times p cubed times one minus p squared. Independence is an assumption for a worked exercise, not a fact established by this classroom experiment. Its maximum occurs at p equal to three fifths and is approximately 0.346. Eight times that maximum is approximately 2.765, below the participation cost three. This calibration therefore has no symmetric interior mixed equilibrium satisfying the indifference condition. That absence does not eliminate the fifteen successful pure equilibria.

The result offers an advanced classroom discussion. Symmetry means everybody uses the same probability; a successful pure profile instead has four acting and two staying out. Equal rules do not require equal actions. Correlated expectations, shared norms or communication may also organize responsibilities. Specify the equilibrium class before concluding a model has failed. An observed distribution from eight rounds does not automatically identify the probability mixture used by each student. A pooled frequency can combine different people, costs and histories rather than reveal one stationary strategy.

3.3 Heterogeneity and sequence

Heterogeneous costs change which participating set minimizes expenditure. With costs one through six and threshold four, the least-cost set contains members with costs one, two, three and four, totaling ten. The successful profile yields 98 ECU jointly. A set with costs three, four, five and six spends eighteen and yields 90. Everybody still receives the same eight-ECU bonus and starts with ten. Differences come from experimentally induced costs rather than actual student characteristics. Public information can help coordinate responsibilities, but the software does not compel students to select the cheapest set.

Under removal four, the material gain from being pivotal is avoiding removal, rather than receiving eight extra ECU. Acting changes own earnings by four minus the cost when the other five actions put the person at the threshold boundary; otherwise it only adds cost. With removal zero, there is no monetary gain from reversal and acting costs three. The same formal threshold can therefore operate under different incentives. Distributional preferences, resistance or solidarity can support other behavior, but instructors should explain the material account before introducing those possibilities. The reference prediction is conditional, not a complete description of political motivation.

Person A also makes the game sequential. A must anticipate how six members respond to either removal choice; members decide after observing it. Removal four followed by failure does not prove a unique solution of the complete game. It can reflect an expectation of coordination that did not materialize. A discussion of subgame perfection would need response strategies for both removal zero and four and would check A's incentives given those responses. The application records choices and outcomes without selecting a theory of expectations on the instructor's behalf.

3.4 Preferences and interpretation

Social preferences can change the subjective cost of leaving responsibility to others, the value attached to others' benefits or willingness to reverse removal. Identity, reputation and norms of shared responsibility may matter in a real classroom. A participation button does not measure those motives directly. Avoid attaching personal labels to nonparticipants or describing a result as a diagnosis of individual values. The teaching objective is to compare explanations and identify what additional observation could distinguish them. Formal monetary accounts and a psychological explanation of the decision process remain separate products.

$$\Delta_i = 8 \Pr(K_{-i} = T - 1) - c_i.$$

Theoretical foundation

The material reference has one no-participation equilibrium and fifteen with exactly four participants. Equilibrium theory does not determine which the class will select. Success, efficiency and distribution of costs are distinct concepts.

Variants and comparisons

4.1 Horizon and thresholds

The extended edition contains twelve configurations per language, including an eight-round reference. The basic edition offers one interaction, ten rounds with fixed groups and ten with rematching. The extended reference supplies the same eight-round horizon used for treatment comparisons; a new label does not itself introduce a mechanism. Each session applies an announced treatment and its own resources. Instructors can run only the comparisons useful for their course instead of making everybody traverse the entire family or a sequence that announces conclusions before decisions.

Threshold two and threshold five keep six members, endowment ten, cost three and bonus eight. At two, success requires a minimum total participation cost of six; at five, fifteen. Maximum joint earnings are 102 and 93 ECU, respectively. Both contain a no-participation equilibrium and successful profiles with exactly the required number. Lower participation under threshold two need not indicate worse coordination: fewer people may be enough to provide the same bonus. Compare success and participation above the threshold together with individual participation rates. The rule changes what a given count accomplishes.

4.2 Private and common signals

Private-signal sessions draw threshold three or five with equal probabilities every round. Each member receives a signal that is correct with probability 75 percent. Signals are independent conditional on the actual threshold; students know the process but not others' signals. A signal indicating three does not guarantee that three suffice. Four realized participations produce success at threshold three and failure at five. The treatment separates uncertainty about the rule from uncertainty about other people's decisions. It does not model an authority deliberately changing the requirement after seeing actions.

The common-signal condition preserves that entire process and adds a signal visible to all six, also 75-percent accurate and conditionally independent of private signals. It changes shared information and expectations about what others know. Success need not rise: an incorrect common signal can coordinate incorrect expectations. Compare it with private signals only, holding horizon, grouping and private precision constant. The report separates realized thresholds and private-signal accuracy; it does not elicit subjective beliefs. Agreement in actions should not be presented as direct evidence that complete common knowledge has been achieved.

With a half prior and one private signal indicating three, the posterior probability of threshold three is three quarters. If the common signal also indicates three, it becomes nine tenths: observing both signals has probability three quarters squared under three and one quarter squared under



BEER Lab · Round 1 of 8

Instructions

Your role: Member

Resources and unit of account

Every member starts each round with 10 ECU; resources renew.

If the required number is reached, every member receives an additional 8 ECU, including those who did not participate.

Participating costs you 3 ECU, even if the required number is not reached.

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

This session does not convert ECU into real money.

The required number can be 3 or 5, with equal probabilities; it is revealed at the end.

Your signal about the required number: **5**

Each signal indicates the required number correctly with probability 75%. It can be wrong. Signals are independent conditional on the actual required number.

The group remains the same throughout the session.

Reference example: with four participants, a participating member receives $10 - 3 + 8 = 15$ ECU and a nonparticipant receives $10 + 8 = 18$ ECU. With three participants they receive 7 and 10 ECU, respectively.

Continue

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Figure 4.1: Variant-specific rules; compare with the corresponding reference.



BEER Lab · Round 1 of 8

Instructions

Your role: Member

Resources and unit of account

Every member starts each round with 10 ECU; resources renew.

If the required number is reached, every member receives an additional 8 ECU, including those who did not participate.

Participating costs you 3 ECU, even if the required number is not reached.

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

This session does not convert ECU into real money.

The required number can be 3 or 5, with equal probabilities; it is revealed at the end.

Your signal about the required number: **5**

Each signal indicates the required number correctly with probability 75%. It can be wrong. Signals are independent conditional on the actual required number.

Common signal: **5**

The group remains the same throughout the session.

Reference example: with four participants, a participating member receives $10 - 3 + 8 = 15$ ECU and a nonparticipant receives $10 + 8 = 18$ ECU. With three participants they receive 7 and 10 ECU, respectively.

Continue

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Figure 4.2: Variant-specific rules; compare with the corresponding reference.

five. If they disagree, the posterior returns to half. These calculations concern information about the threshold. Choosing an action still requires anticipating the other five choices. Correct state updating does not remove the strategic coordination problem. Public information can matter through expectations about other people's reactions as well as its own informational content.

4.3 Costs and first choice

Private and public heterogeneous-cost conditions assign a random permutation of costs one, two, three, four, five and six within each group and round. Endowment and benefit stay unchanged. Each member sees own cost; in the public condition everybody also sees the list by position. Comparing these conditions studies information about the distribution of burdens. A cost-six member may act while a cost-one member does not: the model imposes no ordering of actions. The cost table describes decisions under induced incentives, rather than categorizing personal characteristics or willingness to help outside the laboratory.



BEER Lab · Round 1 of 8

Instructions

Your role: Member

Resources and unit of account

Every member starts each round with 10 ECU; resources renew.

If the required number is reached, every member receives an additional 8 ECU, including those who did not participate.

Participating costs you 4 ECU, even if the required number is not reached.

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

This session does not convert ECU into real money.

At least 4 of the six members must participate.

Announced costs of the six members (ECU): $4 \cdot 1 \cdot 5 \cdot 2 \cdot 6 \cdot 3$

The group remains the same throughout the session.

Reference example: with four participants, a participating member receives $10 - 3 + 8 = 15$ ECU and a nonparticipant receives $10 + 8 = 18$ ECU. With three participants they receive 7 and 10 ECU, respectively.

Continue

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Figure 4.3: Variant-specific rules; compare with the corresponding reference.

BEER Lab · Round 1 of 8

Instructions

Your role: Member

Resources and unit of account

Every member starts each round with 10 ECU; resources renew.

If the required number is reached, every member receives an additional 8 ECU, including those who did not participate.

Participating costs you 3 ECU, even if the required number is not reached.

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

This session does not convert ECU into real money.

At least 4 of the six members must participate.

The group remains the same throughout the session.

One person decides first; the other five observe that action before choosing. The first position rotates among the six people across rounds.

Reference example: with four participants, a participating member receives $10 - 3 + 8 = 15$ ECU and a nonparticipant receives $10 + 8 = 18$ ECU. With three participants they receive 7 and 10 ECU, respectively.

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Figure 4.4: Variant-specific rules; compare with the corresponding reference.

Because costs are redrawn each round, report categories contain decisions rather than permanent sets of individuals. Retain cost and round together when discussing learning. Do not attribute an action change to experience if own cost changed at the same time. Fixed matching preserves people without automatically preserving every random parameter. A causal comparison of information uses the same announced cost process in both conditions. The institutional difference concerns who observes what, rather than selecting a treatment after observing a group's response. Record attendance, allocation and order before playing.

The visible-first-choice treatment replaces simultaneous choice with a sequence. One position acts first and the other five see that choice before deciding. Initial positions are randomized when groups form, and the first-mover function rotates through six positions across the block. Everybody still pays three for participation and receives the same eight under success. The first mover cannot exclude, reward or punish another member. This adapts leading by example; it does not reproduce an executive authority or every protocol studied in the literature. Distinguish visibility and sequence from enforcement power.

If the first mover participates, three further actions are needed to reach four. Otherwise four are needed. This change in the residual requirement must inform comparisons of follower behavior. The report keeps total participation and success; a more detailed conditional table can be reconstructed from position, round and action in the export. An association is not the causal effect of the first action: the first mover chooses it and can anticipate followers. The rotation is an assignment of position, not an externally imposed participation choice. State that distinction before discussing leadership effectiveness.

4.4 Announcements and consistency

Nonbinding announcements are submitted simultaneously before actions. Each member announces participation or nonparticipation, everybody sees six intentions and then chooses freely. There is no free-form chat, reward for truthfulness or automatic commitment. An affirmative intention is not a participation until the decision form is submitted. The reference comparison keeps costs, bonus and threshold. This can teach allocation of responsibilities and the distinction between a promise, an expectation and an action without allowing conversation outside the platform. Announcements chosen by people are never certified as truthful by the system.

The announcements-followed indicator counts matching announcements and actions among members of completed groups with a recorded announcement. Following a negative announcement also counts, so consistency is neither cooperation nor success. A group can follow six negative announcements and fail, or break one announcement and succeed. Ask students to combine consistency and outcomes when discussing the report. Communication research provides related evidence, but this two-option menu is narrower than unrestricted discussion. Its results should not be attributed to every possible effect of deliberation, persuasion or binding agreements.

4.5 Removal, reversal and information

Removal with a known threshold adds A and removes the bonus. Compare selected removal, participation and reversal. A chooses zero or four, so observed removal is endogenous. Sessions can differ because A behaves differently even when members participate at the same rate. Describe responses conditional on removal when that is the teaching question, recognizing that A selected the amount. Such a table does not identify the causal effect of an externally imposed amount. The existing protest family is related through collective resistance but uses concessions, a different fund and a different payment structure.

BEER Lab · Round 1 of 8

Instructions

Your role: Member

Resources and unit of account

Every member starts each round with 10 ECU; resources renew.

If the required number is reached, every member receives an additional 8 ECU, including those who did not participate.

Participating costs you 3 ECU, even if the required number is not reached.

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

This session does not convert ECU into real money.

At least 4 of the six members must participate.

The group remains the same throughout the session.

First each member announces participate or do not participate. Everyone sees the six announcements and then chooses privately. Announcements are nonbinding.

Reference example: with four participants, a participating member receives $10 - 3 + 8 = 15$ ECU and a nonparticipant receives $10 + 8 = 18$ ECU. With three participants they receive 7 and 10 ECU, respectively.

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Figure 4.5: Variant-specific rules; compare with the corresponding reference.

BEER Lab · Round 1 of 8

Instructions

Your role: Person A

Resources and unit of account

Every member starts each round with 10 ECU; resources renew.

A starts with 10 ECU and chooses to remove 0 or 4 ECU from each of the six members. Reaching the required number reverses the removal; otherwise A keeps it. There is no additional benefit in this version.

A does not participate. Each member pays 3 ECU when participating, even if the required number is not reached.

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

This session does not convert ECU into real money.

At least 4 of the six members must participate.

The group remains the same throughout the session.

Example: A removes 4 ECU from each member. If the required number is reached, A ends with 10 ECU; a participating member receives $10 - 3 = 7$ ECU. Otherwise A receives $10 + 6 \times 4 = 34$ ECU and that member receives $10 - 4 - 3 = 3$ ECU.

Continue

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Figure 4.6: Variant-specific rules; compare with the corresponding reference.



BEER Lab · Round 1 of 8

Instructions

Your role: Member

Resources and unit of account

Every member starts each round with 10 ECU; resources renew.

A starts with 10 ECU and chooses to remove 0 or 4 ECU from each of the six members. Reaching the required number reverses the removal; otherwise A keeps it. There is no additional benefit in this version.

Participating costs you 3 ECU, even if the required number is not reached.

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

This session does not convert ECU into real money.

The required number can be 3 or 5, with equal probabilities; it is revealed at the end.

Your signal about the required number: **3**

Each signal indicates the required number correctly with probability 75%. It can be wrong. Signals are independent conditional on the actual required number.

The group remains the same throughout the session.

Example: A removes 4 ECU from each member. If the required number is reached, A ends with 10 ECU; a participating member receives $10 - 3 = 7$ ECU. Otherwise A receives $10 + 6 \times 4 = 34$ ECU and that member receives $10 - 4 - 3 = 3$ ECU.

Continue

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Figure 4.7: Variant-specific rules; compare with the corresponding reference.

The uncertain-removal control draws threshold three or five and provides no signals. The private-signal removal condition preserves exactly that threshold process and gives 75-percent-accurate private signals to the six members. A knows the threshold distribution but receives no signal and cannot see theirs. This isolates information available to participation decision makers without simultaneously changing the requirement's distribution. The plan referred to resistance information without a specified generator; this package defines a concrete threshold-information comparison and documents it as a teaching adaptation. It does not claim to measure a forecast of other people's willingness directly.

Keep A's first move separate when analyzing those two conditions. Signals are not disclosed before the removal choice, but the information rule is public, so A can anticipate a different response. A treatment difference in removal is part of strategic adjustment to the institution. Do not promise that the contrast measures members' responses while holding A's choice fixed. It includes A's endogenous behavior within a common protocol. The adaptation makes the comparison operational while retaining a clear description of what information is and is not manipulated.

4.6 Matching and learning

Fixed groups can develop shared history and adjust expectations; rematching preserves functions and recombines people. Encounters can repeat. Ten rounds do not create a public identity of partners or an automatic reputation mechanism. Keep treatment and matching as separate variables in analysis files. Use the same horizon, rules and compatible attendance to compare matching regimes. A one-shot versus ten-round contrast changes experience as well as repetition. Avoid attributing every difference to changing partners when multiple dimensions of the design differ.

For the instructor

Assign the comparison before observing actions. Keep horizon and all parameters outside the treatment unchanged. Counterbalance order when the same group experiences two institutions. Do not treat A's endogenous removal as a randomly imposed amount.

Report and classroom feedback

5.1 Progress, reveal and denominators

Open the report from the session being analyzed. The administrative page can display technical round ten even for a one-active-round session. Aggregates explicitly traverse every active round and exclude the rest. A completed single interaction must therefore appear as one group-round, rather than zero because the administrative page opened another position. Reports start hidden and reveal becomes available when the full block finishes. Reloading hides aggregates again; use this to prepare projection without showing decisions during play. Never substitute a different session's report merely because it contains more data.

Completed group-rounds are settled interactions. With two groups and ten rounds, twenty are expected. A group lacking any decision supplies no earnings or actions to report aggregates, even if some members submitted their forms. This keeps denominators coherent and prevents a missing response becoming nonparticipation. The raw export retains pending records for diagnosis. Before interpreting an empty report, inspect progress, selected session and blocked participants in Monitor. The report's completion rule concerns the session block, not a promise that waiting disappears after a fixed time.

Participation divides affirmative actions by six times completed group-rounds. Success divides groups meeting their actual threshold by completed group-rounds. These are different denominators. With two groups containing four and zero participants, participation is four out of twelve, or one third, while success is one out of two, or half. A single cooperation rate conceals the distinction. A is excluded from participation under removal but has a separate monetary outcome. Include only members who actually face the binary choice when reconstructing this statistic.

5.2 Distribution, costs and evolution

The histogram displays integer counts zero through six horizontally and numbers of group-rounds in its bars. Groups with three and five participants average four, although only one reaches the reference threshold. Concentration at four describes success with minimum monetary participation; concentration at six can show participation above that minimum; concentration at zero can be compatible with coordination failure. These are conditional descriptions of rules and data, not unique identifications of motives. Ask students what observations disappear when only the mean is retained and why the threshold makes that loss especially consequential.

Own-cost results show heterogeneity in induced incentives. Their denominator is completed decisions at that cost. Required-number results use group-rounds with each realized threshold. In uncertain sessions, differences in success between three and five partly reflect the mechanical difficulty of meeting the rule. Students did not choose the requirement. To teach inference, distin-

guish the exogenous threshold draw, received information and endogenous action. A conditional table helps organize those dimensions but does not by itself reveal how participants processed their signals or anticipated others.

Round evolution presents participation, success and mean earnings. Falling participation with stable success can indicate fewer redundant costs. Falling participation accompanied by failures calls for another interpretation. Inspect realized thresholds and costs before describing trends when parameters are random. Eight points are not an estimate of learning free from noise. Fixed groups share members and history, and rematching preserves individual experience too. The most defensible classroom discussion combines the trajectory with its rules, realized parameters and a clear description of the comparison actually performed.

5.3 Information and discussion sequence

Private-signal accuracy uses only members who received that information. Seventy-five percent is a process probability, not a quota every session must attain exactly. Small samples can contain many incorrect signals or almost none. The table does not establish understanding or signal-following: informational accuracy and decisions are different variables. The common signal is retained in the export when applicable and should not be counted six times as six independent observations. Its shared realization can induce dependence among actions, even though its generating error is conditionally independent of private errors.

Begin feedback with counts and an account, then compare distributions, and finally introduce mechanisms. Ask how many groups completed, what fraction reached the requirement, where the distribution concentrates and what changes when costs and information are considered. Request one statement the data support and another they do not yet support. This sequence prevents a chart from becoming a classification of good and bad people. It also enables instructors unfamiliar with the paradigm to conduct a rigorous discussion without needing the class to produce a predetermined outcome.

The screenshot shows the oTree web interface. At the top, there's a navigation bar with links: Demo, Sessions, Rooms, Data, Server Check, Logout. Below this, the session title is 'Coordination and Collective Action · One round: session 'ocfuynfq' (demo)'. There are several action buttons: New, Links, Monitor, Data, Payments, Report, and Description. Below these, there are input fields for 'App Name' (collective_action_game (10 rounds)) and 'Round Number' (10), with a 'Go' button. The main content area is titled 'Instructor report: coordination and collective action' with a 'Reference' link. It features two summary boxes: 'Completed group-rounds' showing '1 / 1' and 'Pending group-rounds' showing '0'. At the bottom of the completed box are 'Reveal results' and 'Hide results' buttons.

Figure 5.1: Report hidden before interactions are complete.

Measure		
Measure	Value	Observations
Participation rate	66.7 %	4 / 6
Success rate	100.0 %	1 / 1
Ex post pivotal actions	66.7 %	4 / 6

Figure 5.2: Measures and denominators



Figure 5.3: Participation histogram

Outcomes by own cost		
ECU	N	Participation rate
3 ECU	6	66.7 %

Outcomes by required number		
Required number	N	Success rate
4	1	100.0 %

Figure 5.4: Costs and realized thresholds

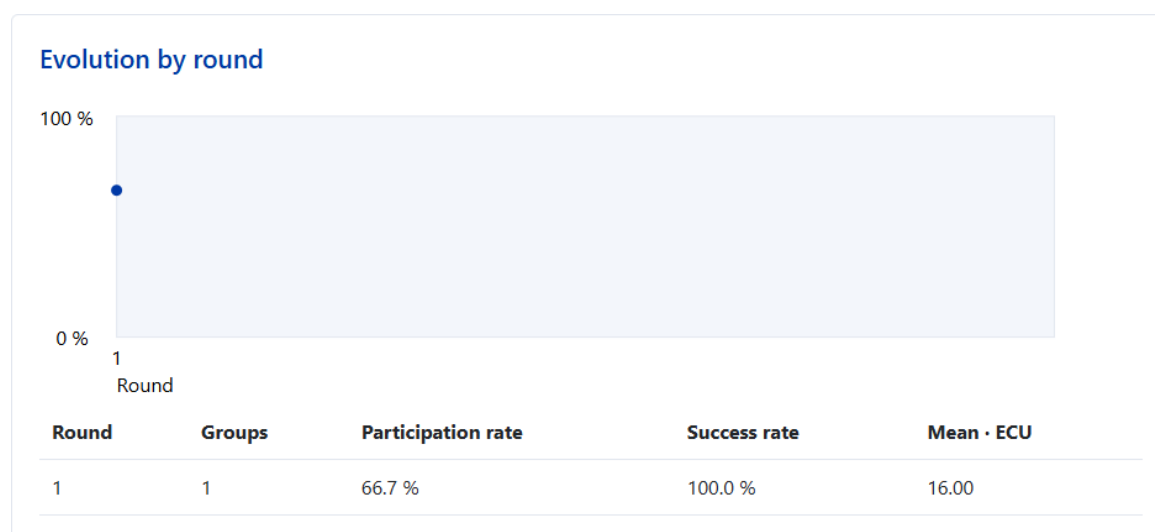


Figure 5.5: Decision and outcome evolution

Feedback script

First describe the observation. Then reconstruct one unilateral deviation and one joint account. Finally compare two compatible mechanisms and the additional evidence needed to distinguish them. Never infer a moral motive from an action without additional information.

5.4 Literature and scope of adaptation

Olson frames shared benefits and collective organization. Granovetter examines how threshold distributions can generate different aggregate outcomes. The provision threshold here is a common rule and must not be confused with a psychological threshold for individual willingness to act. van de Kragt, Orbell and Dawes examine minimal contributing sets. These sources motivate teaching questions without making this application's parameters a literal replication of their experiments.

Suleiman and Rapoport study discrete provision with continuous contributions; Cadsby and Maynes examine continuous contributions and refund guarantees. This family uses binary actions without refunding participation costs following failure. Suleiman develops models of uncertain thresholds. That literature supports separating uncertainty and strategy; the three-or-five generator and 75-percent signals are explicitly announced teaching calibrations.

Güth and colleagues examine leading by example with and without exclusion. Our version retains a visible first decision without exclusion powers. Isaac and Walker study communication in voluntary provision; this intentions menu is a specific protocol rather than a replication of unrestricted conversation. Their findings do not guarantee a classroom effect of the same sign or size. Earlier evidence motivates comparisons and explanatory alternatives, while session observations retain their own design and sample size.

Class plan, exercises and data

6.1 A sixty-minute introductory session

Reserve the first ten minutes for access and rules. Confirm that everybody is in the same session and groups contain six members. Explain ECU and the abstract nature of the roles. Do not announce that the exercise will demonstrate selfishness, solidarity, or a politically preferred institution. The opening should establish the decision problem rather than a desired answer. Address comprehension questions individually before decisions begin, and keep procedural assistance distinct from strategic advice.

Allow approximately fifteen minutes for play. A first experience can use one interaction with more time for reconstruction; use repetition to observe adjustment. Pace depends on reading and attendance, so the timing is guidance rather than a compulsory countdown. During decisions, keep aggregates hidden, monitor progress, and avoid comments about groups participating too much or too little. Such statements can alter expectations and encourage students to target an instructor-imposed outcome.

Use the next ten minutes for accounting. Ask each student to reconstruct their own settlement without announcing individual decisions aloud. Present a common numerical case, such as four participations under the reference, and verify participating members and nonparticipants payoffs. This establishes shared rules before feedback. If accounting errors appear, resolve them before introducing strategies or empirical findings. Students need to know what an action changes before discussing why people selected it.

Allocate fifteen minutes to the report and ten to theory and closing. Show counts, the histogram, and both rates; explain pivotality using two different combinations of others' actions. Present equilibrium multiplicity and the distinction between shared interest and individual willingness. Finish with a short written response describing what was observed, which rule explains it, and what further hypothesis would be needed to discuss motives. This separates evidence, the model, and personal interpretation.

6.2 A ninety-minute comparison

Prepare two eight-round configurations and parallel groups when attendance permits. Assign institutions before observing decisions. Some groups might receive the reference and others communication; another useful comparison is private versus public costs. Use twenty minutes for rules, twenty for decisions, fifteen for accounting, twenty for report comparisons, and fifteen for exercises and synthesis. Adjust pace without changing the number of rounds midway through a session. Consistent horizons support interpretable comparisons.

If all students need to experience both institutions, create two new blocks and counterbalance order across groups. Do not carry accumulated earnings from the first block into the budget financing the second. Announce new rules and bases before decisions. Explain that previous experience can affect the second block even when resources renew. Compare initial rounds and trajectories as well; improvement should not automatically be attributed to whichever institution came second.

Prepare a shared results sheet containing treatment, completed groups, rounds, participation, success, and mean participation. Instructors can copy these aggregates from the report without projecting participant codes. With few groups, invite discussion of uncertainty. A large difference between two groups is not a precise estimate of a population effect. The teaching value comes from linking rules and incentives to observable patterns, identifying alternatives, and explaining what a better research comparison would require.

6.3 Worked exercises and assessment

Accounts and distributions

Give students an individual worksheet before discussing answers together. The first exercise completes a table for zero, three, four and six participations under the reference. At zero, everybody earns ten. At three, participants earn seven and nonparticipants ten. At four, earnings are fifteen and eighteen. At six, everybody earns fifteen. Total earnings are sixty, fifty-one, ninety-six and ninety, respectively. The solution must explain why six participants generate less joint earnings than four even though both groups provide the same benefit. Ask for the resource account as well as the final numbers.

The second exercise presents three participants and asks whose actions are pivotal ex post. A current participant leaving does not change failure. Any of the other three can produce success by joining. Three of six actions are pivotal, giving an indicator of half. Does this imply those people knew what the others would do? No: pivotality uses realized actions without revealing information available before choice. Require a complete sentence distinguishing realized consequences from anticipated incentives rather than accepting only the numerical rate.

The third exercise compares groups with three and five participants. Their mean is four and pooled participation is eight out of twelve. Success at threshold four is nevertheless half. Another pair with four participants in each retains the same mean and individual rate while succeeding in every interaction. The distribution distinguishes those cases and the mean cannot. Ask students to draw the bars and explain which information disappears when only the average is reported. Then ask whether their conclusion would change if the announced threshold were two instead of four.

Incentives and information

The fourth exercise uses costs one through six and threshold four. The cheapest participating set incurs costs one, two, three and four, totaling ten. Successful joint earnings equal sixty minus ten plus forty-eight, or ninety-eight. The four most expensive members incur eighteen and produce ninety. Check unilateral deviations in both profiles. Since each cost is below eight, a pivotal withdrawal loses more bonus than it saves in cost; both profiles can be material equilibria despite their different efficiency. An efficient allocation is not the only possible equilibrium of equal-benefit provision.

The fifth exercise gives a private signal three and a common signal five. Both are three-quarters accurate and the prior is half. The likelihood of these signals under threshold three is three quarters times one quarter, identical to its likelihood under five. The posterior remains half. A private

signal three alone yields three quarters; two signals three yield nine tenths. More information does not mean every realization raises certainty in the same direction. The exercise does not ask students to infer a dominant action from those state probabilities.

The sixth exercise asks for the expected gain from acting when pivotality probability is 0.2 or 0.5. In the reference, eight times 0.2 minus three equals minus 1.4 ECU; eight times 0.5 minus three equals one ECU. The calculation uses material incentives and risk neutrality. Identify the probability entering it: exactly three other affirmative actions, rather than any successful outcome. Eight times success probability answers a different question. Ask students to describe what extra information they would need to assign a defensible numerical pivotality belief before playing.

Institutions and comparisons

The seventh exercise uses removal four and threshold four. With three others acting, joining prevents loss of four and costs three: the material gain is one. With four others acting, reversal already occurs and joining loses three. With only two others acting, one additional action remains insufficient and also loses three. Removal zero creates no material reversal gain in any of these situations. Reconstruct A's earnings and the joint account too, checking that removal is a transfer rather than destruction of resources. This prevents adding the reference bonus to a different institution.

The eighth exercise gives six affirmative announcements followed by four affirmative actions. Announcement consistency is four out of six, while success is one out of one. Six negative announcements followed by no actions give perfect consistency and no success. The first group cannot be called less cooperative simply because it followed fewer announcements: the measures concern different dimensions. Formulate a comparison preserving both and a question about expectations that would require a separate elicitation. A message's accuracy as a predictor of action is distinct from whether the group reaches a collective objective.

The ninth exercise designs a private-signals versus private-plus-common-signals comparison. Keep endowment, benefit, costs, threshold distribution, horizon and matching unchanged. Assign treatment before decisions, record completed groups and account for repeated-round dependence. A within-group before-after comparison also changes experience and order, so counterbalance when feasible. Explain that a common signal can change expectations about other members in addition to providing information to oneself. A correct design names both the manipulated element and the elements intentionally kept constant.

Data and interpretation

The tenth exercise presents eight completed group-rounds and two pending. There are thirty affirmative actions among forty-eight included members and five successful groups. Participation equals thirty over forty-eight, or 62.5 percent. Success equals five over eight, also 62.5 percent by coincidence. Equal percentages do not imply equal denominators. Pending actions are neither zeros nor artificial observations used to fill a histogram. State both definitions before calculating them, and describe what the completion filter removes from each statistic. Then identify which raw records should remain available for diagnosing the pending groups.

Advanced assessment can enumerate all 64 binary profiles. For each, compare six unilateral deviations, identify equilibria and calculate total earnings. This contrasts formal solutions with an actual histogram without imposing an equilibrium-selection theory. Keep enumeration separate from empirical inference: a profile compatible with equilibrium does not demonstrate that the people producing it consciously made those calculations. A mathematical solution and a psychological account of decision making answer different questions. Students should identify which of those

questions the observed choices actually help address.

Close with a two-paragraph note. The first reconstructs a rule and an observed outcome. The second gives two compatible interpretations and proposes a design change that could distinguish them. Grade accounting, denominators, assumptions and inference rather than rewarding a specific participation choice. This uses the laboratory to teach reasoning instead of examining moral disposition. If another session follows, compare how students' explanations changed as well as the actions they selected. An improved explanation can be a learning outcome even when a participant keeps the same decision.

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.

6.4 Data, privacy, and archiving

Export data from the instance of this family. The custom export contains active round, group, role, treatment, matching, threshold, removal, costs, signals, intentions, actions, outcome, pivotality, and earnings. Technical identifiers support joining records during authorized analysis; they should not be projected or included in public teaching material. Retain the original file and a working copy with transformations documented. This enables checking how a summary was constructed without modifying the original record.

Exclude inactive technical rounds and groups without settlement before reconstructing report aggregates. Do not treat an intention without an action as an actual abstention or a pending cell as zero earnings. When combining sessions, add a session variable and retain treatment labels. Document filters, denominators, and horizon so that a colleague can reproduce a table without relying on a screenshot. The raw export and the projected report serve different purposes and require different access decisions.

6.5 Common problems and their remedies

A waiting page on entry to a room may mean no session is assigned yet; check administrative association before requesting decisions. A waiting page inside the game normally indicates a missing form. Inspect the group and pending stage in Monitor. Under communication, everybody must select an announcement, participate or do not participate, and continue. Do not promise that waiting will disappear merely by closing and reopening the page. Find the actual incomplete stage.

A participant-not-found message usually concerns an old link after a database change. Create a new session and distribute current links. Do not fabricate outcomes or delete the database during class to fix a link. If a connection is interrupted, return to the current link for that person and inspect the stage before submitting another decision. Record the incident and consult technical staff if the blockage persists. Preserving the session is necessary for understanding what was completed.

If the report seems empty, verify the session and completed groups. If Demo shows other games, this is not the intended isolated instance. If a basic room offers extensions, stop admission and inspect configuration; the correct package separates three basic choices and twelve extended choices. Differences between individuals' totals can reflect role, action, removal, or costs. Check these against the settlement before describing them as errors. The same observed success does not imply identical individual earnings.

Attention

An instructor should not use a technical remedy to alter submitted decisions or reset data to conceal an unexpected result. Preserve the session and document the problem. A stopped activity needs diagnosis rather than replacing missing observations with invented behavior.

6.6 Dependence and empirical comparisons

The six actions of a group share rules and an outcome. Repeated rounds contain history involving the same people, and the common signal provides a shared realization. Do not treat every row as an independent treatment observation. Identify assignment unit, groups and sessions before proposing statistical tests. With few groups, prioritize description and reasoning. A difference between two sessions does not by itself identify a population effect, even when each contains many choices. Preserve original counts so another person can reproduce the comparison.

Keep treatment files separate and add a condition variable when combining them. Verify that participation, success and earnings use matching definitions. A enters role payoffs but not the participation denominator. A newly drawn cost does not describe a stable student characteristic. A correct signal does not establish that it was used. Retaining these distinctions supports conclusions that remain within the available evidence.

What experimental evidence contributes

Isaac and Walker document greater efficiency with communication in their voluntary contribution mechanism. Güth and coauthors find higher contributions with leadership, especially with exclusion. Cadsby and Maynes show that continuous contributions and money-back guarantees can facilitate provision. This activity uses binary choices, structured announcements and leadership without exclusion, so published magnitudes are not exact predictions for these parameters. The references guide comparisons; they do not make this teaching adaptation a replication. ([Isaac and Walker, 1988](#); [Güth et al., 2007](#); [Cadsby and Maynes, 1999](#)).

Bibliography

- Olson, M. (1965). *The Logic of Collective Action*. Harvard University Press. <https://www.hup.harvard.edu/books/9780674537514>.
- Granovetter, M. (1978). Threshold models of collective behavior. *American Journal of Sociology*, 83(6), 1420–1443. <https://doi.org/10.1086/226707>.
- van de Kragt, A. J. C., Orbell, J. M., and Dawes, R. M. (1983). The minimal contributing set as a solution to public goods problems. *American Political Science Review*, 77(1), 112–122. <https://doi.org/10.2307/1956014>.
- Suleiman, R., and Rapoport, A. (1992). Provision of step-level public goods with continuous contribution. *Journal of Behavioral Decision Making*, 5(2), 133–153. <https://doi.org/10.1002/bdm.3960050205>.
- Suleiman, R. (1997). Provision of step-level public goods under uncertainty: A theoretical analysis. *Rationality and Society*, 9(2). <https://doi.org/10.1177/104346397009002002>.
- Cadsby, C. B., and Maynes, E. (1999). Voluntary provision of threshold public goods with continuous contributions: Experimental evidence. *Journal of Public Economics*, 71(1), 53–73. [https://doi.org/10.1016/S0047-2727\(98\)00049-8](https://doi.org/10.1016/S0047-2727(98)00049-8).
- Güth, W., Levati, M. V., Sutter, M., and van der Heijden, E. (2007). Leading by example with and without exclusion power in voluntary contribution experiments. *Journal of Public Economics*, 91(5–6), 1023–1042. <https://doi.org/10.1016/j.jpubeco.2006.10.007>.
- Isaac, R. M., and Walker, J. M. (1988). Communication and free-riding behavior: The voluntary contribution mechanism. *Economic Inquiry*, 26(4), 585–608. <https://doi.org/10.1111/j.1465-7295.1988.tb01519.x>.