



Instructor's Guide to Federalism, Autonomy, and Territorial Inequality

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 preparation, implementation, and discussion of the federalism, autonomy, and territorial inequality family at BEER Lab.

It is intended for instructors in political science, political economy, and public finance, including those new to laboratory experiments. Operational chapters explain access, decisions, and results.

Conceptual chapters develop incentives and their limitations. Variants describe only changes relative to the common rules.

Author

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For the instructor

This is an original teaching protocol inspired by territorial allocation and shared financing problems. It does not literally reproduce a published experiment or elicit personal political opinions. Participant screens use a neutral regional projects frame. Institutional routes are proposed for the laboratory; the local instance supports testing before deployment.

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Preparation and access

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.

onomía y desigualdad territorial — Una interacción	Federalismo, autonomía y desigualdad territorial / Federalism, Autonomy, and Territorial Inequality — BEER Lab Seleccione una variante de este juego. Select a version of this game.
onomía y desigualdad territorial — Diez rondas con grupo fijo	
onomía y desigualdad territorial — Diez rondas con reasignación	
onomía y desigualdad territorial Extendido — Referencia regional	
onomía y desigualdad territorial Extendido — Decisión centralizada	
onomía y desigualdad territorial Extendido — Desigualdad territorial	
onomía y desigualdad territorial Extendido — Igualación fiscal	
onomía y desigualdad territorial Extendido — Crédito con pago obligatorio	
onomía y desigualdad territorial Extendido — Rescate sujeto a votación	
onomía y desigualdad territorial Extendido — Respaldo automático externo	
onomía y desigualdad territorial Extendido — Movilidad con cupos	
onomy, and Territorial Inequality — One interaction	
onomy, and Territorial Inequality — Ten rounds with a fixed group	
onomy, and Territorial Inequality — Ten rounds with rematching	
onomy, and Territorial Inequality Extended — Regional reference	
onomy, and Territorial Inequality Extended — Centralized decision	
onomy, and Territorial Inequality Extended — Territorial inequality	
onomy, and Territorial Inequality Extended — Fiscal equalization	
onomy, and Territorial Inequality Extended — Credit with mandatory repayment	
onomy, and Territorial Inequality Extended — Bailout by outside vote	
onomy, and Territorial Inequality Extended — Automatic outside support	
onomy, and Territorial Inequality Extended — Mobility with capacity limits	

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

Rooms

Current rooms:

Federalismo, autonomía y desigualdad territorial — Básico
Federalism, Autonomy, and Territorial Inequality — Basic
Federalismo, autonomía y desigualdad territorial — Extendido
Federalism, Autonomy, and Territorial Inequality — Extended

Figure 1.4: Rooms contains the four rooms for this family: basic and extended editions in Spanish and English.

Room: Federalism, Autonomy, and Territorial Inequality — Basic

Create a new session

Session Config

Federalism, Autonomy, and Territorial Inequality — One interaction

Number of participants

Complete groups of 6 participants. Use a multiple of 6; minimum 6.

Create

[Configure session](#) 

App sequence

fiscal_federalism_game (10 rounds)

Figure 1.5: Session-creation form for the basic English room. Check the selected configuration and participant requirement before creating the session.

Downloading a session with several rounds

For the instructor

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

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

1.2 Family summary

Purpose

Six participants form three regions and choose local investment and contributions to a shared fund. Compare regional or central voting, unequal resources, equalizing transfers, self-financed credit, bailout requests, external guarantees, and mobility with limited places. The report shows investment and contribution distributions, regional earnings, loan financing, and actual regional moves.

Experimental unit

One group of six, divided into three regions of two members.

Basic edition

One interaction or ten rounds with a fixed group or rematching.

Extended edition	Eight treatments lasting six rounds with a fixed group.
Decision	Local investment and fund contribution; credit, bailout, or mobility depending on treatment.
Payoff	Earnings in ECU; active rounds are added together.
Participants	Multiples of six; demonstration sessions use twelve participants.
Suggested duration	45–60 minutes; 70–90 minutes with comparisons.
Topics	fiscal federalism; regional autonomy; public goods; territorial inequality; fiscal bailouts; mobility.
JEL	A22; C72; C92; H73; H77; H81.

The activity separates two problems that discussions of federalism often combine. Members of a region first choose how much to invest in a project that benefits its residents. Each person then chooses how much to contribute to a fund benefiting all six people. Extensions change the voting institution, initial resources, assignment of obligations, or possibility of moving between regions. Separating these decisions helps explain why local choices and shared contributions can respond to different incentives even when the same people make both choices.

The instructor need not specialize in game theory. Before class, however, work through the earnings example in the next chapter and complete a demonstration session. The instructor report compares distributions, regions, and rounds. It cannot replace an explanation of which resources are spent and who receives each benefit. A well prepared class begins with understandable rules and ends by connecting those rules to observed outcomes, while treating a small classroom sample as evidence about this activity rather than a diagnosis of actual countries.

1.3 Two access routes

The entry route starts at <https://beer-lab.org/>. From the laboratory website, open the teaching section, <https://teaching.beer-lab.org/>, and select the federalism family. Its catalog title describes the subject for instructors. Participant screens are titled “Regional Projects and a Shared Fund”, allowing decisions to be made without labels suggesting which outcome participants should seek.

The proposed instructor address is <https://federalism.beer-lab.org/demo>. Basic participant rooms are https://federalism.beer-lab.org/room/federalismo_es in Spanish and https://federalism.beer-lab.org/room/federalism_en in English. Extended rooms are https://federalism.beer-lab.org/room/federalismo_extendido and https://federalism.beer-lab.org/room/federalism_extended. These addresses specify the routing design to be installed by the laboratory. Printing them in this guide does not certify that the hostname has already been deployed.

The test instance runs at <http://localhost:8098/demo>. On that computer, substitute `localhost:8098` for the institutional hostname in participant room addresses. Localhost always refers to the computer on which the browser is running. Copying this address to another computer therefore does not automatically connect it to the first computer’s server. For a class, use institutional links confirmed by the laboratory or the network address supplied by its technical staff.

1.4 Selecting a configuration and opening a session

The Demo page supports exploring configurations and rehearsing with participant links. It should not be confused with the entry link distributed to a class. Selecting a configuration creates a session with individual participant links and access to its administrative report. During an individual rehearsal, an instructor may open several links in separate tabs. In class, each student should receive only their own access. Waiting pages require all six members of the relevant group to proceed.

The family contains twenty two configurations: three basic and eight extended configurations in each language. Basic rooms offer only the three basic modes; extended rooms offer only the eight extended treatments. Selecting a language determines all session text, including instructions, validation errors, results, and the report. There is no additional language decision during a round. This arrangement preserves one common application and prevents rules from diverging across translations.

For a first class, select a single interaction. To study learning within the same set of people, choose ten rounds with a fixed group. To reduce group continuity, select ten rounds with rematching. Rematching does not guarantee that every pairing is new: some people may meet again when the participant pool is small. All extensions use six rounds with a fixed group. This keeps the horizon comparable across extended treatments and gives the mobility condition a meaningful history of regional membership.

Checkpoint

Before creating a session, confirm its language, treatment, number of rounds, and participant count. The count must be divisible by six. Check that the room corresponds to the selected version and that each student has a distinct link. Replace a session created with incorrect parameters with a new session; do not change the rules of a session that has already started.

1.5 Preparing the classroom and monitoring progress

Ask participants to enter once all computers are ready. Present the laboratory's general rules: remain quiet, do not discuss decisions, and raise a hand for an operational question. This family does not include communication between participants as a treatment. An unplanned conversation may change expectations and coordination, so it should not be introduced informally into a comparison intended to involve private choices.

The welcome page requires acceptance of the rules before proceeding. Instructions and comprehension questions follow. An incorrect answer can be corrected and does not subtract ECU. If several people miss the same question, explain the rule again to the whole class without suggesting a decision. The instructor can explain who pays for an investment or receives a fund benefit, but should not recommend contributing more, requesting a bailout, or staying in a particular region.

Monitor progress through the instructor panel. A waiting page usually means another group member is still reading or deciding. It is not evidence of an error by itself. If someone leaves, decisions depending on that group member may remain blocked; contact laboratory staff before closing or substituting participants. The activity does not invent decisions for absent people or impose a default choice to accelerate the session.

1.6 Rehearsal, privacy, and operational closure

A useful rehearsal covers welcome, comprehension, decisions, results, and closure with six complete participant accesses. Also open the report before any outcomes exist and after at least one group completes a round. Reloading it must keep results hidden until the instructor explicitly reveals them. Before projecting, close tabs containing individual participant links and confirm that the visible window contains only the session summary.

The report excludes groups that have not completed the corresponding round. A class with twelve participants may therefore temporarily have a summary based on six decisions. Explain coverage before discussing averages. At the end, export data through the authorized administrative area and retain the configuration alongside the date and teaching context. Technical session and participant codes organize the data file; they should not be projected or replace understandable region and treatment names.

The final screen displays earnings summed over active rounds and confirms completion. It does not include a button leading to an empty page. The instructor then continues with the report and collective discussion. If monetary conversion is used, announce that conversion and the payment rule before the session. The program records ECU; this guide sets no exchange rate and promises no financial incentive. Confirming these arrangements in advance avoids changing the meaning of decisions after their outcomes have been observed.

Common rules and the participant journey

2.1 Resources, regions, and sequence

Each group contains six people and three regions. Regions are identified by number and color rather than country names or political identities. Two people belong to each region. In the reference condition, every participant receives an income of 30 ECU and a reserve of 10 ECU: initial resources total 40 ECU per round. Resources renew at the start of the next round. Previous earnings accumulate in the final summary but do not become the budget for a new decision.

The common sequence begins with a summary of the round and regional membership. Participants vote on investment, wait for the group to complete this stage, and then choose individual contributions to the shared fund. Earnings are calculated and an account is displayed. Credit extensions add financing decisions; mobility adds a move request before the local vote. No variant asks participants to decide about party preferences, personal experiences, or demographic characteristics.

With fixed groups, the same six people interact throughout the session. Without mobility, they also retain their regional positions. With rematching, the system forms groups and regional positions again in every round. Screens show current membership, so participants need not personally recognize other members. Instructor interpretation should distinguish group continuity, regional continuity, and simply repeating the task: these are separate experimental changes with different possible consequences.

2.2 Voting on a regional project

Each resident votes for an investment of 0, 10, or 20 ECU. Effective investment in their region equals the average of its two votes. Outcomes can therefore be 0, 5, 10, 15, or 20 ECU. Votes of 10 and 20 produce investment of 15; the program does not randomly select one proposal. Each resident pays half the investment and receives a benefit equal to 0.75 times regional investment. In the reference condition, a resident does not directly pay for the other two regions' local projects.

If investment is 20, each resident pays 10 and receives 15, producing a net project gain of 5 ECU. If investment is 10, each pays 5 and receives 7.5, obtaining 2.5 net. Both residents receive the same regional benefit even when they cast different votes. A vote changes a shared decision; it does not create a separate prize for the person proposing the larger investment.

Investment denotes the total size of the regional project, not expenditure by each participant. This distinction prevents subtracting 20 from each resident when the project itself costs 20. It also explains fractional ECU: averaging votes and dividing costs create amounts such as 2.5 or



Welcome to BEER Lab

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

Read the rules and decide individually. After the activity, the instructor will discuss aggregate results.

Laboratory rules

- Keep quiet and do not talk to other people.
- Decide individually and privately; use only messages enabled on screen.
- Follow the instructions and keep the page open.
- Do not refresh or close the window while waiting.
- If there is a problem, raise your hand and ask for help privately.

☐ I have read the laboratory rules.

Start

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Figure 2.1: Institutional welcome and acceptance of laboratory rules.



BEER LAB · ROUND 1 OF 1

Regional Projects and a Shared Fund

Resources and unit of account

Your starting income in the displayed round: 30 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.

You belong to a six-person group divided into three regions of two members. First vote on a regional investment, then choose an individual contribution to the fund for all six people. All earnings are in ECU.

Your region's project

Each member votes 0, 10, or 20 ECU. The average of the two regional ballots applies: 0, 5, 10, 15, or 20. Each member pays half the investment and receives a benefit of 0.75 ECU per ECU invested. Benefits are not cash advanced for later decisions.

The six-person fund

After observing regional investments, each person contributes an integer from 0 to 10 ECU. The sum of all six contributions is multiplied by 0.25 to calculate each person's benefit, whether they contributed or not. Your contribution costs exactly the amount chosen.

Rules for this session

The two people in each region vote and their average applies. Income 30 plus reserve 10 per person.

One interaction; regions assigned at the start · 1 rounds

Resources for each round

Reference income is 30 ECU per person plus a 10 ECU reserve. This session's rules specify any changes to income or transfers. Costs are deducted and benefits added at the end. Resources renew each round; previous earnings do not finance new decisions. Completed-round earnings are added together.

Information and privacy

Regional membership and implemented investments are public within your group. Your submitted contribution is private; only the shared-fund total is announced at the end. Do not discuss or coordinate decisions outside the screens. History shows investments and totals, not individual contributions.

Reference calculation example

If your region's implemented investment is 20 ECU, you pay 10 and receive 15. If you contribute 10 and all six contributions total 60, you receive 15 from the shared fund. Without credit, transfers, or movement, your earnings are $30 + 10 - 10 - 10 + 15 + 15 = 50$ ECU. Ballots are proposals; the implemented investment may differ from your own ballot.

Continue

Con tecnología de oTree

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

7.5. Decision fields use discrete values, while earnings accounts may contain decimals. Instructors should allow students to work through a fractional example before treating an unfamiliar decimal as an interface problem.

BEER LAB · ROUND 1 OF 1

Vote on an investment

Your current region: **Region 1**

Submit your ballot without seeing others' current ballots. Under the regional rule, the average of your region's two ballots applies. Your cost will be half the implemented investment.

Your ballot for regional investment (ECU)

☒ 0 ECU

☐ 10 ECU

☐ 20 ECU

[Continue](#)

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Figure 2.4: Individual vote: the program calculates the average of the two residents' choices.

2.3 Contributing to the shared fund

After observing effective investment, each participant chooses an integer contribution between 0 and 10 ECU. Let c_i denote their contribution and $C = \sum_{j=1}^6 c_j$ the group total. Each person receives $0.25C$ ECU from the fund regardless of whether they contributed. When someone contributes one additional ECU, all six people receive another 0.25 each: total benefits increase by 1.5 ECU. The contributor pays one ECU and recovers only 0.25 of that increase.

Contributions are not selected through regional voting. Each person chooses their own amount, and all six choices enter the same fund. The upper limit remains 10 in every treatment, including those changing initial resources. More income does not automatically expand the permitted contribution set. This rule supports comparisons of marginal incentives without combining inequality with a change in decision limits.

The program does not reveal individual contributions before calculating outcomes. Time spent on a waiting page cannot establish another person's contribution. The total becomes available when the stage ends. In repeated sessions, the round summary may show aggregate history from the same group, but it does not provide a public list of individual choices or permit messages. Students should distinguish information displayed by the mechanism from guesses about what someone elsewhere in the room might be doing.

2.4 Earnings account and worked examples

In the reference condition, earnings for a person belonging to region r are

$$\pi_i = 40 - \frac{l_r}{2} - c_i + 0.75l_r + 0.25C = 40 + 0.25l_r - c_i + 0.25C,$$

BEER LAB · ROUND 1 OF 1

Choose your shared-fund contribution

Region 1 Current members: Member 1 Member 2 Implemented investment: 5 ECU	Region 2 Current members: Member 3 Member 4 Implemented investment: 15 ECU	Region 3 Current members: Member 5 Member 6 Implemented investment: 20 ECU
---	--	--

Each ECU you contribute is deducted from your earnings and included in the group total. Every person receives 0.25 times that total. This screen shows implemented investment, not others' ballots or current contributions.

Your contribution (integer from 0 to 10 ECU)

Continue

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Figure 2.5: Private contribution decision, between zero and ten ECU.

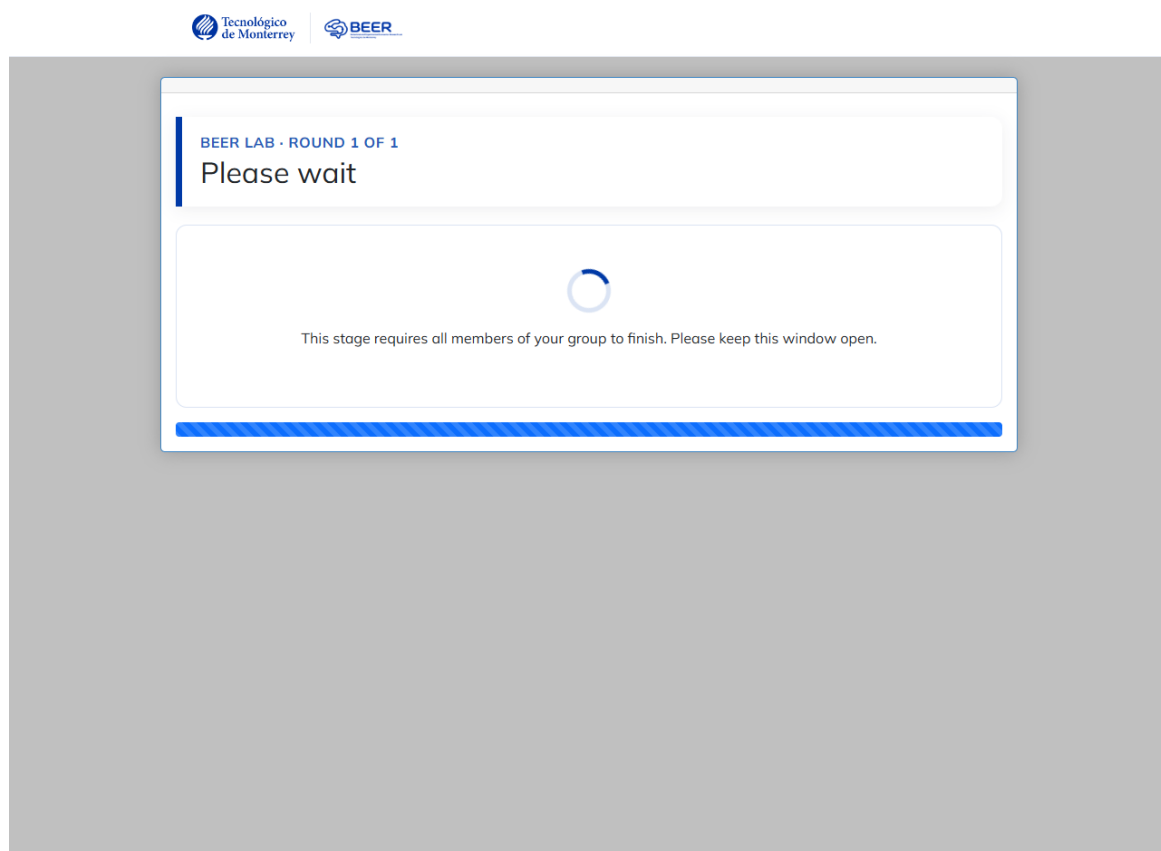


Figure 2.6: The waiting screen synchronizes group decisions before results are calculated.

where l_r denotes effective investment in that person's region. The first expression tracks every inflow and outflow; the second identifies incentives. Both represent exactly the same account. Do not add income of 30 to the initial 40: the reserve of 10 is already included in those 40 ECU.

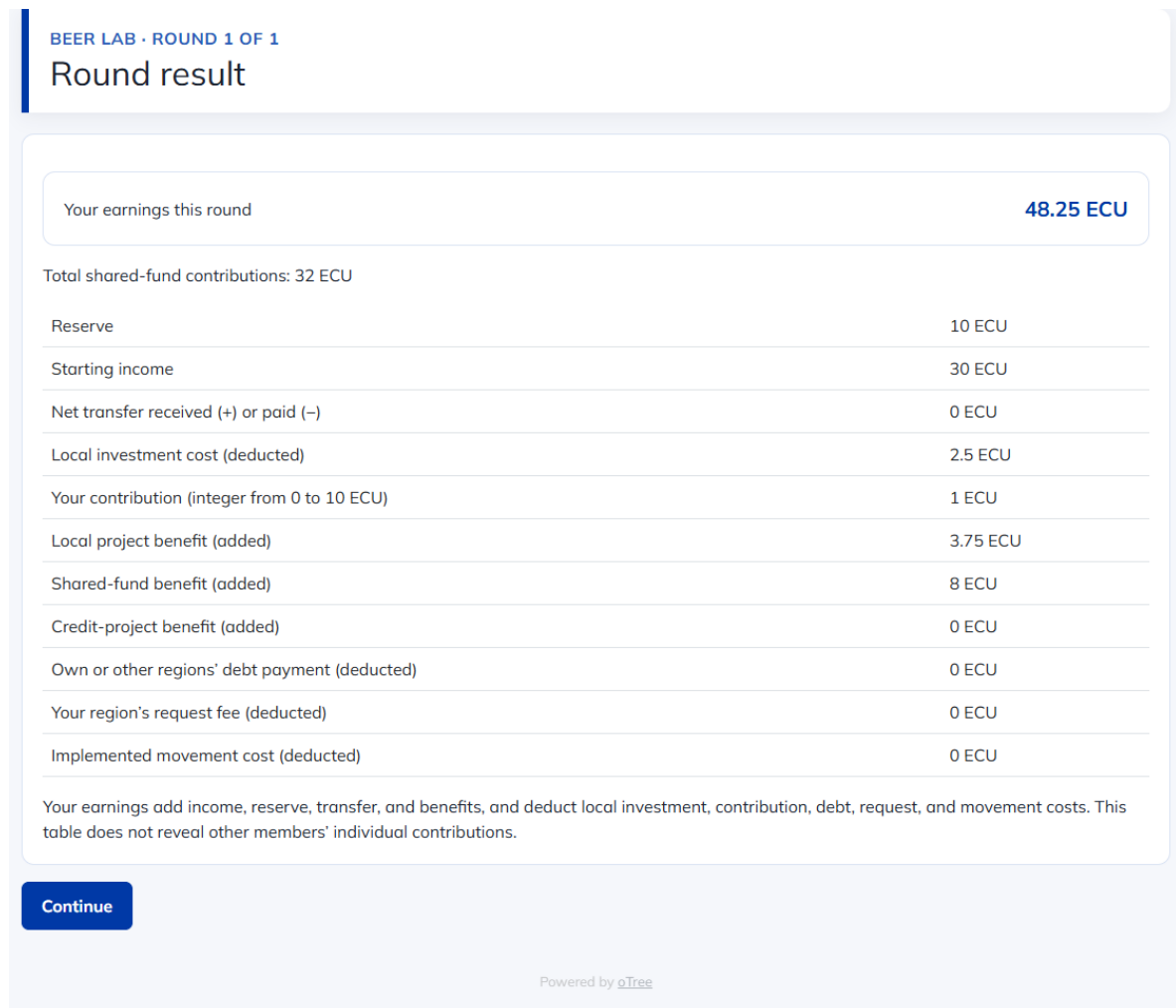


Figure 2.7: Individual earnings account at the end of a reference round.

Consider a group in which every region invests 20 and all six people contribute 10. The fund collects 60 and returns 15 to each person. Every participant finishes with $40 - 10 - 10 + 15 + 15 = 50$ ECU. Keeping investment at 20 but removing all contributions yields $40 - 10 + 15 = 45$ each. With neither investment nor contributions, each retains 40. These three outcomes compare complete accounts and avoid calling every benefit generating choice cooperation.

A second example separates individual from group effects. Suppose regional investment is 10 and contributions are 0, 2, 4, 6, 8, and 10. The fund collects 30 and returns 7.5 to each person. A person contributing 4 receives $40 - 5 - 4 + 7.5 + 7.5 = 46$. A person contributing zero, with the same investment, receives 50. Their four ECU difference reflects different contributions, not a different sharing rule. For the whole group, contributions increase shared benefits while reducing the contributor's own earnings when other people's choices are held constant.

What participants will see

The results screen separates initial resources, transfers, local cost, contribution, regional benefits, and the shared fund benefit. Extensions additionally show credit benefits and repayment charges, request fees, and moving costs. Inapplicable entries are zero. Participants can compare this account with the instructions before proceeding to another round.

2.5 Comprehension, information, and the final screen

Comprehension questions check three rules: regional investment of 20 costs each resident 10; a fund total of 10 returns 2.5 to each person; and all six people benefit from the fund. Incorrect responses can be corrected without a penalty. These questions check the common mechanism rather than prior knowledge of federalism. Treatment specific instructions must also be explained before starting, particularly credit obligations and limits on regional places.

The last screen reports earnings summed over all active rounds. Ten rounds are consequential decisions rather than an unpaid repetition of one choice: each round generates recorded earnings. This protocol does not randomly select a single payable round. A larger sum after ten rounds than after one round does not demonstrate greater efficiency; compare earnings per participant per round when horizons differ. If real incentives are used, the laboratory must establish in advance how the sum translates into the announced payment rule.



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

BEER LAB · ROUND 1 OF 1

Check your understanding

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.

If implemented investment is 20 ECU, how much does each member of that region pay?

Your answer: 11. The correct answer is 10. Review the example: each member pays half the investment, each person receives 0.25 of the total, and there are six beneficiaries.

If the six contributions total 10 ECU, how much does each person receive from the shared fund?

How many people receive the shared-fund benefit, whether they contributed or not?

Continue

Con tecnología de [qTree](#)

Figure 2.8: Current comprehension check with an incorrect answer, its specific explanation, and retained responses.

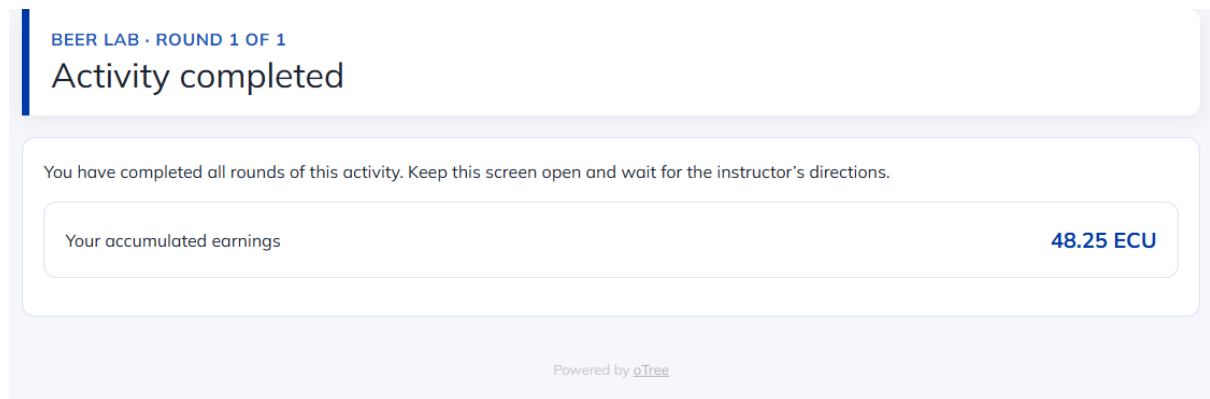


Figure 2.9: Explicit closure with accumulated earnings and no additional empty page.

Theoretical foundations and links to evidence

3.1 What assigning a responsibility means

Fiscal federalism examines how functions, resources, and obligations are distributed across levels of government. Separate who decides, who benefits, and who pays. In this activity, a region chooses its reference project, its two residents receive local benefits, and those residents share its cost. The common fund has six beneficiaries and six individual contribution decisions. Centralization changes the project decision rule; transfers change resources; credit changes obligations. These institutional changes are related but are not interchangeable.

Oates (1999) reviews the assignment of functions and reasons for decentralizing or coordinating services. The general argument depends on factors including local preferences and effects across jurisdictions. Material preferences over the local project are homogeneous here. Comparing a regional average with a central median therefore does not provide a complete test of the decentralization theorem. It studies a specific decision mechanism with observable costs and benefits under deliberately simplified conditions.

Ask students to identify three columns of an institution: decision, benefit, and financing. Introduce terms such as autonomy, centralization, and externality only after they can fill those columns. This approach lets students reconstruct the problem even without remembering a textbook definition. The relevant question is how changing the assignment of a function alters choices and consequences, rather than which level of government sounds preferable in the abstract.

3.2 Self-interest in the local project

In the reference condition, each resident's net project gain equals $0.25l_r$. Increasing their own vote from 0 to 10 raises the regional average by 5, holding the other resident's vote fixed. Earnings therefore rise by 1.25 ECU. Moving from 10 to 20 produces the same increment. A participant maximizing material earnings alone strictly prefers to vote 20 regardless of the other resident's vote. This prediction does not require the other resident to be generous or contribute to the fund.

This result prevents a common interpretation error: higher local investment does not demonstrate altruism under these parameters. Each resident benefits directly and gains materially from casting a higher vote. High voting can be fully consistent with self-interest. The shared fund contribution has a different structure. The activity's teaching value comes from comparing two choices that benefit other people while giving the decision maker different private incentives.

Theoretical foundation

With material earnings as the only objective, a vote of 20 is strictly dominant and a contribution of zero is strictly dominant in a reference round. The predicted profile produces investment of 20 in every region, no contributions, and 45 ECU per person. Maximizing aggregate earnings also requires investment of 20, but contributions of 10, producing 50 ECU per person.

3.3 The shared fund dilemma

Holding others' contributions fixed, one additional ECU of contribution reduces the contributor's earnings by $1 - 0.25 = 0.75$ ECU. For all six people, it raises benefits by 1.5 at a cost of one, increasing aggregate earnings by 0.5. The gap between private and social returns creates the dilemma. It does not require an unfair fund or deception: it follows directly from the earnings formula.

For a reference group, summed earnings can be written as

$$W = 240 + 0.5 \sum_{r=1}^3 l_r + 0.5C.$$

Initial group resources total 240. Each project costs its investment once and delivers 1.5 times that investment to its two residents together. The fund generates the same aggregate gross return of 1.5 per contributed ECU. These calculations produce the two net terms of 0.5. The feasible maximum is 300, and the one round self-interest outcome is 270. The difference of 30 is the net benefit of the 60 possible contributions, not resources lost by the program.

The mechanism belongs to the voluntary contribution family. [Isaac and Walker \(1988\)](#) experimentally investigates communication and voluntary provision. That study provides a related reference for discussing cooperation; this application neither replicates its protocol nor includes a communication extension. Its results should not be imported as a numerical prediction for this class. Contributions depend on the particular mechanism, expectations, and implementation conditions.

3.4 Social preferences, expectations, and learning

A positive contribution may reflect concern for others, a sharing norm, expected reciprocity, a preference for equal outcomes, or confusion. The amount alone does not identify which explanation operates. Someone contributing 10 may value the group's benefit or mistakenly believe their entire contribution will be returned. Comprehension questions reduce some misunderstandings but do not transform a single choice into a clean psychological trait measure.

Repetition reveals trajectories and responses to history. Fixed groups can support expectations of future responses; rematching changes that continuity. Under self-interest, common knowledge, and the reference condition's finite horizon, the standard prediction remains zero contribution in every round. Declining contributions do not by themselves establish equilibrium learning: disappointment or changing norms can produce a similar pattern. Rising contributions do not prove reputation because the application neither asks motives nor elicits beliefs.

Compare first and last rounds using the full distribution. Ask how many people continue to contribute intermediate amounts rather than focusing only on a falling average. Check whether the number of completed groups changed. If an additional survey is used to discuss reasons, present it

as separate, voluntary information unrelated to payoffs. Do not retrospectively turn a classroom interpretation into a variable supposedly measured by the game.

3.5 Centralization and nonpivotal votes

The central extension orders all six votes and averages the third and fourth, applying that value to all three regions. Everyone materially prefers higher investment, but one person can change their vote without changing the median. Voting 20 is weakly dominant: it never lowers common investment and sometimes raises it. The word weakly matters. It does not imply a unique equilibrium in which everyone votes 20.

For example, if all six vote zero, one person switching to 20 leaves the third and fourth votes at zero. Their earnings do not rise. The all zero profile can thus be a weak Nash equilibrium under this rule even though everyone prefers high investment. It illustrates limited individual influence and vote coordination, not heterogeneous local needs. If central investment is lower, examine the distribution of ballots and nonpivotality before attributing the outcome to opposition to the project.

This distinction is useful beyond the experiment. A policy outcome can remain unchanged after an individual changes their stated preference. The unchanged outcome does not establish indifference between policies. Likewise, a ballot that is weakly optimal may not alter observed aggregate behavior when other ballots already determine the result. Keep these statements separate when explaining what dominance and equilibrium do and do not predict.

3.6 Mobility and budget constraints

[Tiebout \(1956\)](#) supplies the classic reference for choice across jurisdictions and motivates questions about mobility and services. This extension retains two places per region, renewed resources, and common material preferences. It provides neither unlimited entry nor a community market with heterogeneous preferences. Fulfilling a move request requires a feasible assignment together with other requests. Limited capacity is part of the design rather than an accidental technical obstacle.

[Kornai et al. \(2003\)](#) organizes the soft budget constraint concept. Expectations of external support can change earlier choices before a bailout is observed. The application separates own repayment, approval by other regions, and an automatic guarantee to explore that logic. Every loan is repaid within the round; there is no persistent default. The exercise therefore addresses cost assignment and anticipated support without estimating sovereign risk, bank solvency, or a dynamic debt crisis.

3.7 What the literature contributes and what the class establishes

[Güth et al. \(2005\)](#) experimentally studies centralization and tax morale using two regions. It motivates questions about institutions and cooperation but does not establish that all centralization reduces contributions in every mechanism. [Ania and Wagener \(2016\)](#) develops a theoretical evolutionary model of decentralized redistribution. Although its title refers to a “laboratory federation”, it should not be presented as human participant evidence equivalent to this activity.

A rigorous connection proceeds from theory to protocol to evidence. First explain incentives derived from our rules, then describe observed behavior, and finally use a reference to discuss the mechanism. Matching predictions does not establish common reasoning; deviations require checking assumptions. Preserve sample size and context when comparing groups.

Extended treatments and comparisons

4.1 A common six round reference

The extended version contains a six round regional reference and seven institutional changes. All retain six person groups and an individual contribution limit of 10 ECU. The extended reference preserves the fixed group basic rules while using six rounds. It is the appropriate control for comparing extensions without also changing the horizon. The ten round basic mode can study repetition but should not silently replace this control.

Do not combine rules through verbal instructions. Selecting inequality does not automatically activate mobility, and selecting a guarantee does not also activate equalizing transfers. Each treatment is a specific configuration. Studying interactions between institutions requires a further explicit design. The available treatments provide classroom options without making every session a factorial experiment containing all possible combinations.

4.2 Central decisions through the median

Centralization replaces the two resident average with a common decision derived from six votes. After ordering those votes, the program averages the third and fourth. All three regions receive the same investment. Each resident still pays half the cost of their regional project and receives 0.75 times investment. The fund remains unchanged. The direct institutional change is the rule determining local investment applied everywhere.

With votes of 0, 0, 10, 10, 20, and 20, common investment is 10. Under regional voting, outcomes depend on which two votes belong to each region. For example, pairs of 0 and 0, 10 and 10, and 20 and 20 produce projects of 0, 10, and 20. Total project investment coincides in this example, but territorial distribution differs. Comparing averages without examining regions would conceal this difference.

For the instructor

When discussing centralization, ask which ballot could have changed the third or fourth ordered value. Distinguish preferring higher investment from being able to change it individually. The median rule can sustain weak equilibria with low investment; do not claim a unique equilibrium by extrapolating strict dominance from regional averaging.

BEER LAB · ROUND 1 OF 6

Vote on an investment

Your current region: **Region 3**

In this session all six people vote on one investment for all three regions. The six ballots are ordered and the average of the third and fourth applies. Each person pays half that investment and receives 0.75 times the amount.

Your ballot for regional investment (ECU)

☒ 0 ECU
☐ 10 ECU
☐ 20 ECU

Continue

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Figure 4.1: Central voting: six ballots determine one common investment.

4.3 Unequal resources and equalizing transfers

In the inequality treatment, individual income is 20, 30, and 40 ECU in regions one, two, and three. The reserve remains 10. Initial resources are consequently 30, 40, and 50 per person. With two residents in each region, initial group resources remain 240. Marginal project and fund formulas do not change. Each person can still contribute between 0 and 10, and every region votes among the same three investment proposals.

The treatment asks whether different resources change contributions, earnings, or allocation standards. Under material payoff maximization alone, best responses remain voting 20 and contributing zero. Inequality changes earnings levels without changing these decisions' marginal returns. If residents with more resources contribute more, the observation may relate to perceived ability, norms, or preferences, without attributing it to an expanded permitted contribution limit.

Equalization starts with those same unequal incomes. Each region three resident transfers 10 ECU, and each region one resident receives 10; region two has no transfer. Transfers sum to zero. Resources after transferring become 40 per person. The transfer is automatic: it is not voted on, does not depend on contributions, and is not financed by the shared fund. This separates initial redistribution from subsequent cooperation.

The most informative comparison is inequality against equalization: gross income assignment is retained and a defined transfer is added. Comparing equalization against the reference is also useful, but those conditions have equal final resources and different accounts of their origin. Explain that distinction before interpreting a contribution change as a purely monetary effect. Final earnings can diverge again if subsequent decisions differ.

4.4 Credit with own repayment: a hard constraint

Three treatments add regional credit. Both residents vote for 0, 10, or 20 ECU, and their average is applied. The maximum is 20 per region. All credit finances an additional project; it is not cash available for increasing contributions. Each resident receives a benefit of $0.30b_r$, where b_r is their region's credit. This return deliberately differs from the ordinary local project. The entire



BEER LAB · ROUND 1 OF 6

Regional Projects and a Shared Fund

You belong to a six-person group divided into three regions of two members. First vote on a regional investment, then choose an individual contribution to the fund for all six people. All earnings are in ECU.

Your region's project

Each member votes 0, 10, or 20 ECU. The average of the two regional ballots applies: 0, 5, 10, 15, or 20. Each member pays half the investment and receives a benefit of 0.75 ECU per ECU invested. Benefits are not cash advanced for later decisions.

The six-person fund

After observing regional investments, each person contributes an integer from 0 to 10 ECU. The sum of all six contributions is multiplied by 0.25 to calculate each person's benefit, whether they contributed or not. Your contribution costs exactly the amount chosen.

Rules for this session

Starting incomes 20, 30, and 40 per person by region, plus reserve 10. Before decisions, every region-3 person pays 10 ECU and every region-1 person receives 10; region 2 neither pays nor receives. Transfers sum to zero.

Same six-person group; fresh resources each round · 6 rounds

Resources for each round

Reference income is 30 ECU per person plus a 10 ECU reserve. This session's rules specify any changes to income or transfers. Costs are deducted and benefits added at the end. Resources renew each round; previous earnings do not finance new decisions. Completed-round earnings are added together.

Figure 4.2: Equalization specifies initial incomes and automatic transfers.

principal is collected within the same round.

Under own repayment, each resident pays back $b_r/2$. Their net credit effect is $0.30b_r - 0.50b_r = -0.20b_r$. With credit of 20, each receives 6 and pays 10, losing 4 compared with taking no credit. Voting zero is a strictly optimal material response under regional averaging. This control assigns benefits and costs to the same residents.

The benefit coefficient is not a bank interest rate. Credit carries no interest and offers no maturity choice. The 0.30 per resident represents an additional project's return, whose total benefits are smaller than its cost. The purpose is to make excessive investment observable when decision makers shift repayment to others. The application does not model heterogeneous productive investments or provide a general financial decision about every possible kind of loan.

4.5 An automatic external guarantee

With an automatic guarantee, the four people in other regions pay every positive regional loan, at $b_r/4$ each. There is no support request, approval vote, or request fee. Beneficiaries retain their project return while others finance their obligation. A participant can pay loans from both other regions, so charges add together.

Holding other regions' credit fixed, increasing own credit raises own earnings without increasing own repayment. Voting 20 is consequently strictly optimal in material terms, contrasting with voting zero under own repayment. If every additional project uses credit of 20, total obligations are 60. Total benefits are 36 and aggregate losses are 24, regardless of how charges are reassigned. A change in the financing institution therefore can alter the investments selected before it alters any observed repayment account.

An example without ordinary projects or contributions shows distribution. If only one region borrows 20, own repayment leaves its two residents with 36 each and the other four with 40. Under a guarantee, the two beneficiaries receive 46 and the four financiers receive 35. Both outcomes total 232. The mechanism changes prior incentives and distribution; shifting costs does not create resources.

4.6 A bailout request requiring external votes

This condition retains credit voting and adds a decision after contributions. Residents of a region with positive credit choose own repayment or an external support request. Own repayment applies directly only when both choose it. If either asks for support, a regional request exists. Every resident in that requesting region then pays a fee of one ECU, even if the other preferred own repayment or support is eventually rejected.

The four people in other regions vote on each request. Approval requires at least three favorable votes. Two in favor and two against means rejection. Nobody votes on their own region's request. Requests are resolved in the same stage, with no sequential bargaining or messaging between voters. A region may request support while its members simultaneously vote on requests from other regions.

Approval charges the four outsiders $b_r/4$ each, including those voting against. Rejection charges the requesting region's two residents $b_r/2$. The entire loan is collected in either case. A request neither cancels debt nor creates default. Request fees do reduce aggregate earnings because they are not transferred to another participant. Explain the difference between reassigning an obligation and adding a real cost when discussing results.

BEER LAB · ROUND 1 OF 6

Vote on an investment

Your current region: **Region 3**

Submit your ballot without seeing others' current ballots. Under the regional rule, the average of your region's two ballots applies. Your cost will be half the implemented investment.

Your ballot for regional investment (ECU)

- ☒ 0 ECU
- ☐ 10 ECU
- ☐ 20 ECU

The two credit ballots are averaged: at most 20 ECU per region. All credit finances an additional project returning 0.30 ECU per ECU to each member of that region. You receive no cash to contribute. The full debt matures at the end of this same round and does not carry over.

Your ballot for additional regional credit (ECU)

- ☐ 0 ECU
- ☐ 10 ECU
- ☒ 20 ECU

Continue

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Figure 4.3: Credit voting appears only in financing extensions.

Attention

Requests, approvals, and guarantees are different variables. A borrowing region may not request support; a request may be rejected. A guarantee requires neither requests nor votes. An approval percentage must use actual requests as its denominator. When no requests exist, that percentage is undefined rather than zero.

With credit of 20, requesting and receiving approval changes own earnings by $6 - 1 = 5$; requesting and receiving rejection changes them by $6 - 10 - 1 = -5$. If the subjective approval probability is q , the expected project gain with a request is $10q - 5$, positive for $q > 0.5$. This compares borrowing and requesting against having no credit. A different comparison, requesting against repaying an already incurred loan of 20, favors requesting when $10q > 1$, or $q > 0.1$. The thresholds answer different questions and should not be interchanged.

A materially interested external voter prefers rejection when pivotal because the project benefits already belong to another region and approval raises their charge. However, with four favorable votes, one voter switching leaves three approvals. A weak equilibrium can exist through nonpivotality. Do not present rejection as a unique inevitable outcome. The design supports discussion of expectations, support norms, and voting problems without separately measuring each possible motive.

The decision stages also matter for interpretation. Support voters act after borrowing has been chosen and its benefit assigned. They cannot prevent the earlier credit decision by rejecting a request. Their rejection changes the financing location, while full repayment still occurs. Ask students to distinguish an ex ante incentive to borrow from an ex post decision about bearing an obligation that already exists.

BEER LAB · ROUND 1 OF 6

Choose how to resolve the credit

Region 1	Region 2	Region 3
Current members: Member 1 Member 2	Current members: Member 3 Member 4	Current members: Member 5 Member 6
Implemented investment: 15 ECU	Implemented investment: 15 ECU	Implemented investment: 0 ECU
Implemented regional credit: 20 ECU	Implemented regional credit: 20 ECU	Implemented regional credit: 20 ECU

If both members choose to repay, each pays half their regional debt. If at least one requests support, the region asks the other four people to finance its debt. The request costs each member of your region 1 ECU, even if rejected. If rejected, the debt is still collected: half from each member.

Choose how to resolve the credit

☐ Repay our regional debt
☒ Request outside support (1 ECU per member)

Continue

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Figure 4.4: Residents choose own repayment or activation of a costly regional request.

BEER LAB · ROUND 1 OF 6

Vote on other regions' requests

Only the four people from other regions vote on each request. At least three yes votes approve it; two are insufficient. If approved, every outside person pays one quarter of that debt, including no voters. Each request is resolved separately; your charges may add up. If rejected, the requesting region pays.

Region 1

If approved, your charge is: **5 ECU**

Region 1

☐ Yes
☒ No

Region 2

If approved, your charge is: **5 ECU**

Region 2

☒ Yes
☐ No

Continue

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Figure 4.5: Other regions vote; three of four votes are needed for approval.

4.7 Mobility with limited capacity

This extension uses the fixed group and allows a request for any of the three regions at the start of each round, before voting. Each region must retain exactly two residents. The system considers feasible sets of moves, selects one fulfilling the largest number of requests, and breaks ties through random priority independent of choices. Priority is recorded for auditing and does not depend on who presses the button first.

Staying is free. Rejected requests are also free. Only an executed move costs two ECU. New membership persists into the next round; income and reserves renew. An isolated request to enter a full region cannot be fulfilled without another compatible departure. A swap between two people or a cycle across three regions can free the required places. Requesting and actually moving are consequently different outcomes.

Last round's aggregate investments provide context about regions within the same group. They do not guarantee the next outcome because mobility changes some of the residents voting. No color carries a direct relocation reward, and this treatment does not include unequal regional incomes. Moves may reflect expectations about partners, coordination, or costs. Discuss these possibilities without claiming each move reveals a stable territorial preference.

BEER LAB · ROUND 1 OF 6

Request a region

Each region has two slots. Request a region or stay. The system chooses the feasible set fulfilling the largest number of requested moves while keeping two people per region. Ties use a fresh random priority independent of your decisions. An isolated request may be rejected if no other move frees a slot. Only an implemented move costs 2 ECU. Your new region persists into the next round; resources renew.

Your current region: **Region 2**

Request a region

- ☐ Region 1
- ☐ Region 2 (stay)
- ☒ Region 3

Continue

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Figure 4.6: A regional request faces two resident capacity and costs only when a move occurs.

BEER LAB · ROUND 1 OF 6

Regional membership confirmed

Your current region: **Region 3**

Check your confirmed region before voting. Any movement cost is deducted when this round settles. You remain in the same six-person group.

Region 1

Current members: Member 5 Member 6

Implemented investment: **0 ECU**

Region 2

Current members: Member 1 Member 2

Implemented investment: **0 ECU**

Region 3

Current members: Member 3 Member 4

Implemented investment: **0 ECU**

Continue

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Figure 4.7: Membership confirmation before regional voting.

Reading the instructor report

5.1 Revealing data and checking coverage

Open the report from the session’s administrative area. It begins with results hidden. Participant and group round counters permit monitoring without projecting decisions. Select “Reveal results” when discussion should begin and “Hide results” when returning to instructions. Reloading restores the hidden state. This control supports classroom management; instructor access must still be protected by the laboratory’s administrative credentials.

The basic coverage unit is a group completing a round. Twelve people form two groups. Ten rounds produce twenty expected group rounds and one hundred twenty individual observations at completion. Six rounds produce twelve expected group rounds and seventy two observations. This counter does not mean twenty or twelve different groups exist. The same group contributes observations at different times.

A group still completing contributions does not enter the distribution partially. Once it finishes, its six people and three regional investments are included. A round with one completed group and one pending group has a contribution sample of six and an investment sample of three. Announce this distinction before comparing it with another round. A missing bar because data are unavailable does not represent a choice of zero.

oTree Demo Sessions Rooms Data Server Check Logout

Federalism, Autonomy, and Territorial Inequality — One interaction: session '8lihoe29' (demo)

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

App Name Round Number

fiscal_federalism_game (10 rounds) 10 [Go](#)

BEER LAB

Instructor report: fiscal federalism

Regional reference
Progress and aggregate results for this session. Decisions appear only after disclosure.

Participants 12	Completed group-rounds 0 / 2	Pending group-rounds 2
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[Reveal results](#) [Hide results](#)

Figure 5.1: Initial report state: progress is visible and outcomes remain hidden.

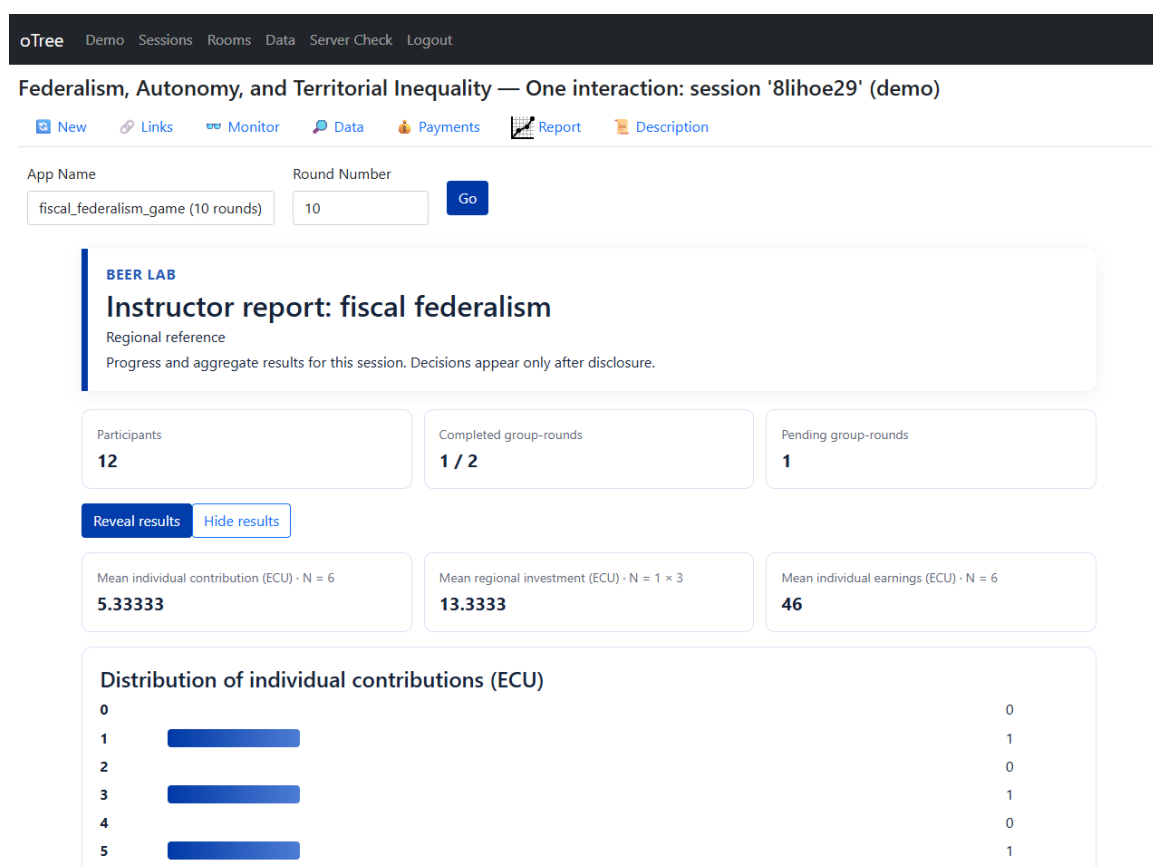


Figure 5.2: Partial report: denominators include only groups completing the round.

5.2 Two distributions with different observation units

The contribution histogram has eleven values, from zero to ten. Each bar counts individual decisions at that value; its length represents their share of the included sample. These are not regional averages. Two classes with the same mean can have different distributions: half contributing zero and half ten gives a mean of five, as does everyone contributing five. The first distribution is polarized and the second concentrated.

The regional investment histogram has five possible values: zero, five, ten, fifteen, and twenty. It counts implemented regional projects, not individual votes. Different ballots can produce the same investment. To study disagreement between residents or influence on the median, consult exported votes. Do not attribute ballot information to a graph that contains only implemented investments.

Pooling rounds gives several observations per person. The overall mean describes recorded decisions rather than independent individuals. Such aggregation supports descriptive classroom discussion. Statistical treatment comparisons, however, require a design accounting for dependence within groups. Do not calculate significance as though one hundred twenty repeated choices came from one hundred twenty distinct subjects.

5.3 Regions, resources, and earnings

The regional panel consistently uses blue, orange, and purple. Its table shows coverage, investment, contribution, initial resources, and net transfers. Earnings bars share a zero to eighty ECU scale, making lengths comparable within the panel. Colors identify regions rather than classifying people

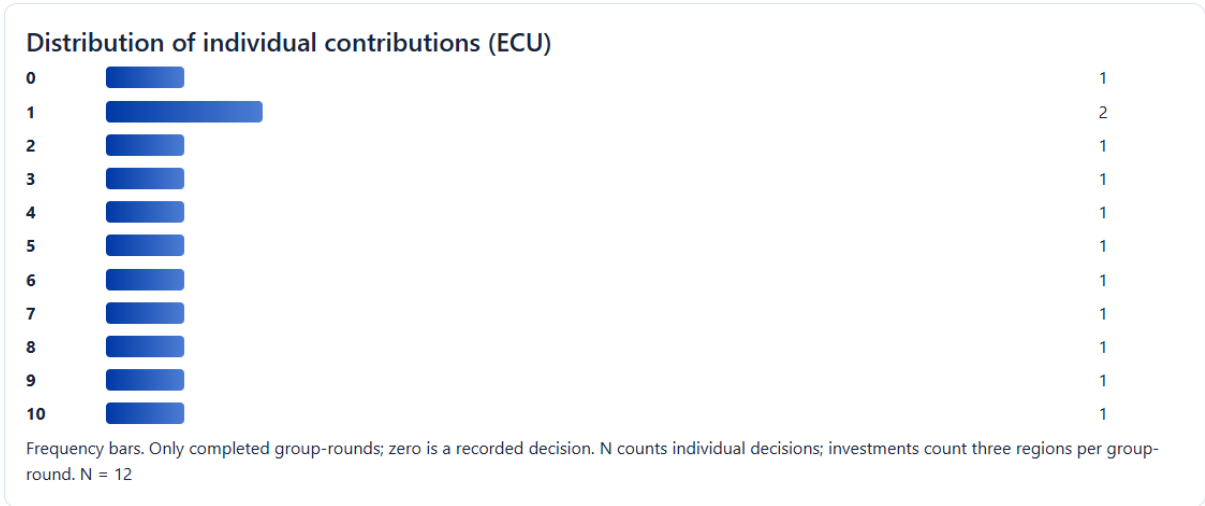


Figure 5.3: Individual contribution distribution with frequencies and feasible values.



Figure 5.4: Implemented regional projects, with three observations per completed group round.

as cooperative, selfish, or deserving support.

Under inequality, higher earnings in region three can arise from higher initial income even with identical choices. Use the resources column to separate starting levels from decision returns. Under equalization, gross income remains unequal but transfers equalize resources before decisions are calculated. Examining final earnings alone could conceal the redistribution of twenty ECU in total between the two extreme regions.

With mobility, averages use the current region in each round, whose composition may change. Improved regional earnings do not necessarily mean the same people improved; new residents may have joined. Following individual trajectories requires the authorized export and previous and current region columns. Keep projected discussion at the aggregate level and avoid publicly identifying particular students.

The table also helps prevent an additional mistake. A region’s average contribution is an average of its residents’ individual fund choices, whereas its implemented investment is one shared project amount. Similar numbers in those two columns do not indicate equivalent behavior. Ask students to state the observation unit and financing rule each time they compare columns, especially when a chart uses the same ECU label for both variables.

5.4 The round trajectory

The time plot displays average contributions by round on a zero to ten ECU scale. The accompanying table reports coverage and average earnings. Only rounds containing completed groups receive data points. A single interaction produces one point rather than an estimated trend. Pending rounds in an ongoing session have no outcome value. The line should not be interpreted

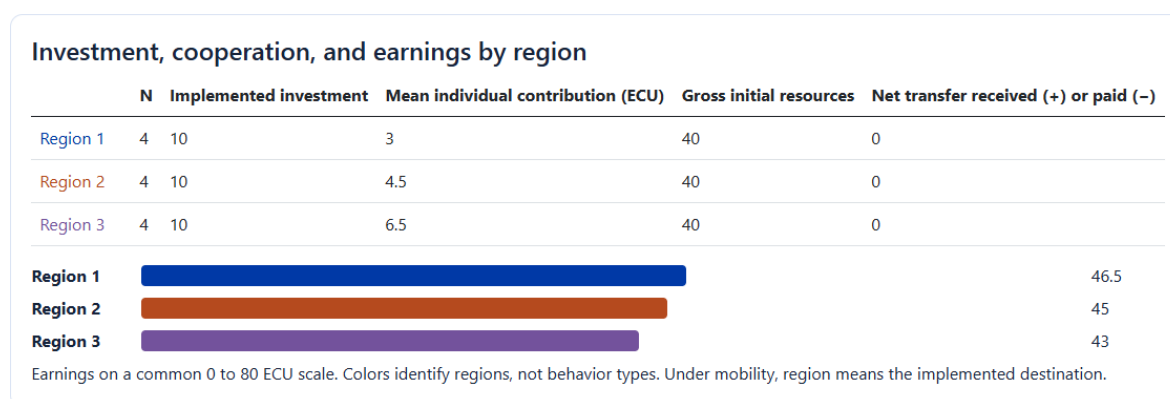


Figure 5.5: Regional comparison with resources, transfers, and earnings on a shared scale.

as predicting decisions that have not yet occurred.

Compare the same measure over equivalent horizons. Accumulated earnings rise mechanically with more rounds, whereas the average per decision supports comparisons of cooperation. If contributions decline near the end, relate the pattern to history and the announced horizon without diagnosing individual motives. Ask whether regional investment stayed high while contributions fell: that contrast illustrates the two choices' different incentives.

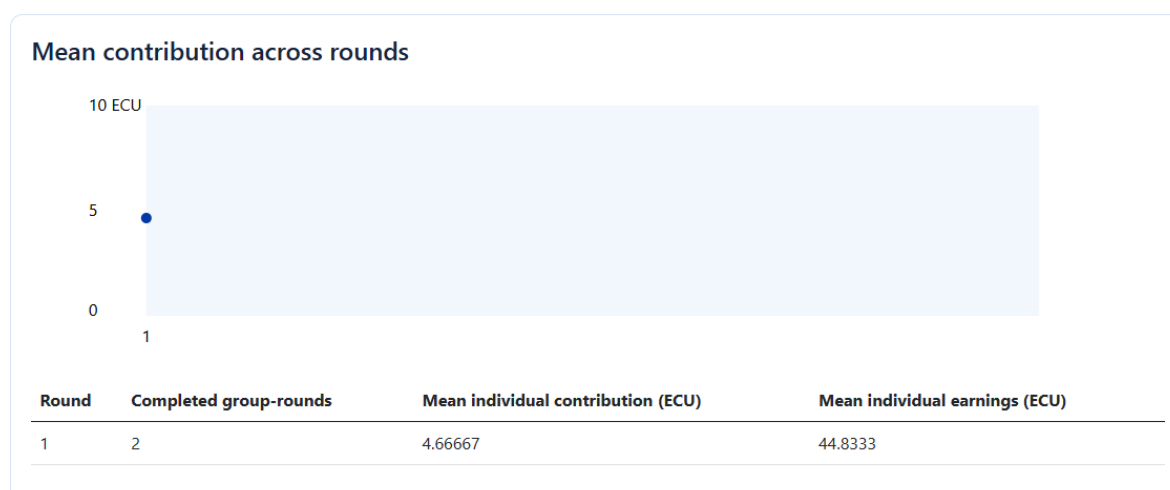


Figure 5.6: Contribution trajectory with round coverage and average earnings.

5.5 Credit and mobility indicators

For credit, the report separates financed volume, collected charges, projects with credit, requests, support allocations, and request fees. Charges must sum to total credit from completed rounds. Under a guarantee, support is automatic and there are no requests; the ratio using requests therefore has no defined value. With voting, the percentage uses actual requests rather than all regions or all individual choices.

For example, six regional observations with positive credit, two requests, and one approval produce a fifty percent approval rate, not sixteen point seven percent. The first denominator asks what happened to requests; the second mixes in regions that never requested support. Either resident can activate a regional request, but it is counted once and costs two ECU in total. The report separates that fee from reassigned principal payments.

For mobility, the request denominator includes only people asking for another region. Choosing to stay does not count as a relocation request. The rate divides executed moves by these requests. If

four people request a change and two succeed, the rate is fifty percent and total moving cost is four ECU. If nobody requests a change, the rate is undefined. Feasible assignments, places, and requested destinations matter when explaining rejections.

Support and movement rates answer narrow operational questions. A high support rate does not establish optimal investment, and a low movement rate does not establish satisfaction with current services. Financing costs and capacity can generate those rates even when individual preferences differ. Begin discussion with the programmed mechanism, then describe the observed rate, and only afterward offer plausible explanations that the available data do not independently identify.

Feedback script

Start with coverage, describe the distribution, and then connect incentives with results. Ask: what observations does this graph count, what cost does the decision maker bear, and who receives the benefit? Compare regions and treatments after answering these questions. An isolated mean cannot describe coordination, distribution, or financing.

Teaching, exercises, and troubleshooting

6.1 A sixty minute introductory class

Use the first ten minutes to introduce territorial assignment without announcing an expected outcome. Draw three regions with two residents each and one common fund. Ask who decides, pays, and receives each benefit. Allow another ten minutes for welcome, instructions, and comprehension. Check that everyone can explain the individual cost of a project of 20 and the individual return from a fund total of 10.

Choose the single interaction mode when the objective is to introduce the conflict between private and social returns. Allow about fifteen minutes for voting, contributing, and reading individual accounts. Speed depends on comprehension and synchronization, so do not force decisions simply to meet a timetable. Use the next fifteen minutes to reveal coverage, contribution distribution, regional investment, and earnings. Finish with ten minutes for incentive derivations and a short written application question.

A useful discussion sequence starts with description, proceeds to explanation, and ends with conceptual transfer. First ask which values appear and how many observations they include. Then compare the private and group effects of one additional contributed ECU. Finally ask which financing institution might change that difference. Separate experiencing a decision from the later task of theoretically explaining an outcome.

Feedback script

“Everybody received fund benefits. Does that mean contributing was individually profitable? Calculate what happens when one person increases their contribution by one ECU and nobody else changes. Then repeat the calculation for the entire group. Why do the answers differ? Now examine our distribution: does it describe one behavior or several responses to the same incentive?”

6.2 A ninety minute comparative class

For an advanced class, choose one substantive comparison and preserve discussion time. Possible pairs are reference and centralization, inequality and equalization, or own repayment and automatic guarantee. Extended sessions last six rounds. One group may complete a condition followed by another, but order introduces learning and experience. If dividing the class, assign complete groups of six to each condition and retain common timing and instructions.

Do not claim a classroom comparison automatically identifies a causal effect. Random assignment to sufficiently many groups improves the design; assignment based on availability or previous experience may affect the comparison. For sequential conditions, alternate order where feasible and explain the reason. Record order, participants, treatment, and incidents. An illustrative teaching objective is legitimate as long as conclusions remain aligned with that objective.

Allow twenty minutes for entry and comprehension, thirty for selected decisions, thirty for reports and exercises, and ten for a short written response. Ask students to describe the mechanism, make a prediction, and state an interpretation limit. Do not try to run every treatment in one class. The full set supports selecting comparisons; choosing a session focus neither removes other extensions nor reduces the family's scope.

A teacher can also pause discussion until both conditions finish to avoid revealing one group's pattern before another group decides. If results are discussed between conditions, record that information exposure as part of the teaching sequence. Students who saw cooperation in an earlier report may change expectations later. This does not invalidate the class exercise, but it changes what the comparison can establish and should be acknowledged in the debrief.

6.3 Exercises with instructor solutions

6.3.1 A vote and a contribution are different choices

Ask what changes when one resident raises their vote from 10 to 20 while their partner's vote stays fixed. Regional investment rises by five and own net earnings rise by 1.25. Then ask what changes when their contribution rises from four to five while all others stay fixed. Own earnings fall by 0.75 and aggregate earnings rise by 0.5. The solution separates a materially profitable local choice from a contribution with a net private cost.

As a follow-up, have students describe each behavior without assigning a motive. "Voted for higher investment" and "made a positive contribution" describe observations. "Is altruistic" adds an interpretation that neither action alone identifies. This exercise connects measured variables, preference models, and explanations of behavior. A strong answer should use the correct counterfactual: only the specified person's choice changes, with other choices held constant.

6.3.2 Reconstructing inequality and equalization

Suppose every region votes 20 and contributions are zero. Under inequality, earnings per person are 35, 45, and 55: initial resources of 30, 40, and 50 plus five from the project. Under equalization, all receive 45. Group totals remain 270 in both conditions. In this profile the transfer reduces inequality without directly increasing aggregate resources. Subsequent contribution changes can alter group totals through fund returns.

Ask students to separate the mechanical resource difference from a behavioral response. Comparing regional earnings combines both. Comparing contributions asks about choices under unchanged marginal rules. This distinction explains why equality and efficiency measures do not always answer the same question and should be reported together. It also prevents treating an equal final allocation as evidence that everyone made an equal contribution.

6.3.3 Checking credit and requests

Consider credit of 20 in every region, no ordinary investment, and no contributions. Under own repayment, each resident earns $40 + 6 - 10 = 36$. Under the guarantee, each pays five for both

other regions and also finishes with 36. Both profiles total 216. This ex post equality does not eliminate the ex ante incentive difference: each region prefers less own credit when repaying it and more when shifting its cost elsewhere.

If all request support under voting, add one ECU in fees per resident. Approving or rejecting all requests leaves total principal at 60. The group loses another six ECU in fees and totals 210. Approving some requests changes charge distribution without making principal disappear. Verify that identity before discussing the morality of support. Then ask which expectations might have changed earlier borrowing decisions.

In a final step, distinguish the two expected payoff thresholds for credit of 20. Requesting an already chosen loan is preferable to own repayment when approval probability exceeds one tenth. Borrowing and requesting yields a positive gain relative to no credit only above one half. Students often confuse these because both involve approval expectations. Writing the alternatives explicitly makes clear why timing and the relevant comparison matter.

6.3.4 Regional capacity and moves

One region one resident requests region two and the other five stay. No assignment fulfills that request while retaining two places per region, so it is rejected without cost. If a region two resident requests region one, the two can swap and each pays two. If three people from different regions form a cycle, all three may move at a total cost of six.

When several solutions execute the same number of moves, random priority selects among them. Ask students to distinguish capacity, feasibility, and tie breaking. Favorable priority cannot create a place in a full region without a departure. Work through the problem on paper after viewing mobility indicators. A rejected request need not be a platform error or evidence that no participant wanted a change.

6.4 Assessment and links to the course

A short assessment can require a prediction derived from payoffs, a report description with the correct denominator, and an inference limitation. For example, a student can explain why contributing reduces own earnings with others fixed, count zero contribution decisions, and recognize that motives were not elicited. Assess reasoning rather than whether a particular choice was made during play.

In political science, connect regional decisions, aggregation rules, and financing to autonomy and interjurisdictional coordination. In public finance, emphasize transfers, fiscal externalities, and obligation assignment. In game theory, discuss strict dominance, weak dominance, and nonpivotal voting. In behavioral economics, consider social preferences and expectations as possible explanations while identifying additional information needed to distinguish them.

6.5 Data, incidents, and continuity

The export retains treatment, matching, round, previous and current region, votes, contributions, and earnings accounts. Credit, requests, approvals, and mobility priority appear when applicable. Filter active rounds and completed groups before calculating outcomes. Blank fields for inapplicable pages are not observed zeros: not voting on a nonexistent request does not mean voting against it.

For a prolonged wait, first inspect the other five group members' progress. If a link returns "Not Found" or says a participant does not exist, confirm that it belongs to the current session and

correct server. An old individual link may stop working after a database change. Obtain current session links with laboratory assistance; do not reset a database or erase classroom records to resolve the issue.

If the catalog includes another game family, check the hostname and instance configuration. This family should contain twenty two configurations and four rooms. If a room offers unrelated treatments, stop entry through that room and request an isolation review. If report outcomes appear on initial load, or a screen shows repeated text or damaged characters, record the affected page so presentation can be corrected before class use.

Checkpoint

Before closing, confirm completion or record pending groups, retain the configuration name, export through authorized access, distinguish complete from partial samples, hide the report, and document incidents or treatment order. To repeat the activity with another class, create a new session and distribute its current links.

6.6 Limits to preserve in the debrief

The activity has a small group, equal regional populations, renewed resources, and discrete decisions. It includes no representative government elections, heterogeneous territorial production, persistent debt, default, or communication. Its value is making particular incentives visible rather than replacing a general model of federalism. Extensions change obligations or decision rules; they do not rank actual institutions from best to worst.

Close discussion by bridging formulas and intuition. Ask for a case in which decision makers receive benefits while others pay, and another in which the same people decide and pay. Then ask how predictions might change with different regional needs or future debt. These questions introduce further models without attributing absent features to the executed protocol. Clarity about the activity's scope is part of its pedagogical rigor.

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