



Instructor's Guide to Fiscal Capacity Investment and Political Turnover

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 fiscal-capacity investment and political-turnover activity available through the Behavioral and Experimental Economics Research Lab (BEER Lab) in the Department of Economics at Tecnológico de Monterrey. It is written for instructors with different levels of experience in experimental economics, public finance, and political economy. The guide defines the concepts from the beginning, derives the predictions, and offers a structured path from observed choices to classroom feedback.

The document offers three reading paths. The **quick guide** is sufficient to launch a basic session. The operational chapters explain screens, rooms, the instructor report, and contingencies. The conceptual chapters develop institutional investment, turnover risk, benefit allocation, and the exercise of capacity. An instructor comparing treatments can proceed to the extended variants after reading the benchmark model.

Common instructions appear only once. Each variant then states what changes, the resulting prediction, the chart to project, and a question that helps distinguish mechanisms. This family is an original classroom adaptation inspired by the state-capacity literature. It is neither a literal replication of one published experiment nor a measure of participants' personal political attitudes.

Author

This guide was prepared by Stanislao Maldonado, research professor in the Department of Economics at Tecnológico de Monterrey, Monterrey Campus. For questions or suggestions about its content, please contact the author at stanislao.maldonado@tec.mx.

For the instructor

The guide follows the English interface. Spanish configurations implement the same institution and parameters. The public routes in this document are proposed deployment routes; development was validated on the isolated local instance. Never project individual codes or connect decisions to names, student IDs, or seats in the laboratory.

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Quick implementation guide

1.1 Access through the updated laboratory website

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

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

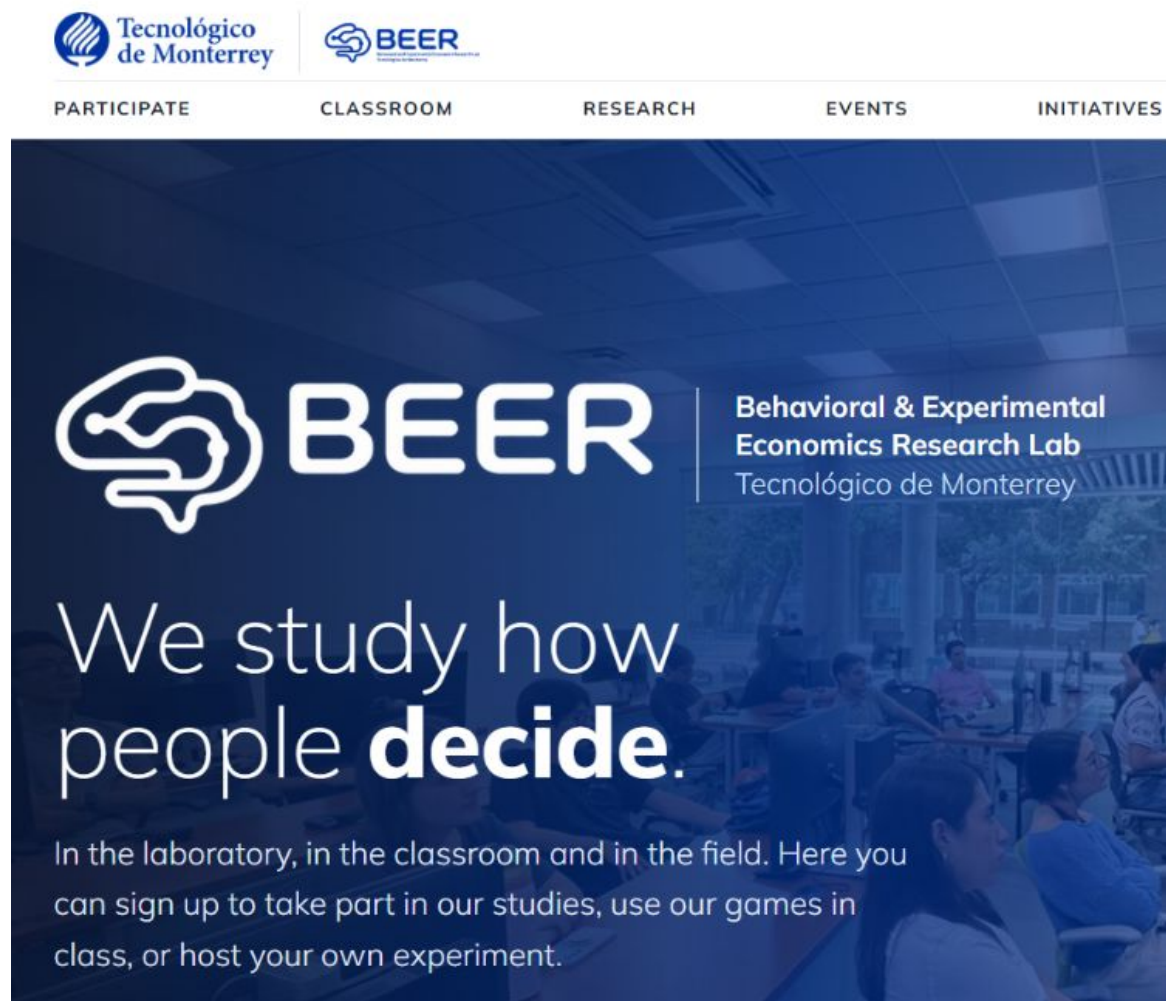


Figure 1.1: Institutional website: select Classroom to open the teaching catalog.

Fiscal Capacity

Topic ▾

JEL code ▾

Fiscal Capacity Investment and Political Turnover

Study how political continuity and the distribution of returns shape current investment in fiscal capacity. Basic: One encounter, four encounters with a fixed pair and rotating roles, or four encounters with reassignment and rotating roles. Extended: Benchmark, likely turnover, inclusive benefits, secure government, persistent capacity, external finance, political competition, and discretionary use.

fiscal capacity
public investment
political turnover
commitment

taxation
political economy

JEL A22 · C92 · D72 · H11 · H20

Address: fiscalcapacity.beer-lab.org

Español

English

☐ Show extended version

Figure 1.2: Find the family and select its language and edition.

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

Demo

[ES] Capacidad fiscal — un encuentro
[ES] Capacidad fiscal — 4 encuentros, pareja fija
[ES] Capacidad fiscal — 4 encuentros, pareja reasignada
[EN] Fiscal Capacity — one encounter
[EN] Fiscal Capacity — 4 encounters, fixed pair
[EN] Fiscal Capacity — 4 encounters, reassigned pair
[ES] Capacidad fiscal extendida — referencia
[ES] Capacidad fiscal extendida — alternancia probable
[ES] Capacidad fiscal extendida — beneficios inclusivos
[ES] Capacidad fiscal extendida — gobierno A seguro
[ES] Capacidad fiscal extendida — capacidad persistente
[ES] Capacidad fiscal extendida — financiamiento externo

Figure 1.3: Demo shows only this family: first part of its configurations.

[ES] Capacidad fiscal extendida — competencia política endógena
[ES] Capacidad fiscal extendida — uso discrecional
[EN] Extended Fiscal Capacity — benchmark
[EN] Extended Fiscal Capacity — likely turnover
[EN] Extended Fiscal Capacity — inclusive benefits
[EN] Extended Fiscal Capacity — certain government by A
[EN] Extended Fiscal Capacity — persistent capacity
[EN] Extended Fiscal Capacity — external financing
[EN] Extended Fiscal Capacity — endogenous political competition
[EN] Extended Fiscal Capacity — discretionary use
[ES] Capacidad fiscal extendida — Destino elegido y alternancia probable
[ES] Capacidad fiscal extendida — Destino elegido y continuidad probable

Figure 1.4: Session configurations in Demo, continued.

[ES] Capacidad fiscal extendida — Programa compartido obligatorio
[ES] Capacidad fiscal extendida — Alto retorno compartido
[ES] Capacidad fiscal extendida — Retornos propios iguales
[ES] Capacidad fiscal extendida — Menor exclusión del otro grupo
[ES] Capacidad fiscal extendida — Aprobación de la otra posición
[EN] Extended Fiscal Capacity — Chosen allocation and likely turnover
[EN] Extended Fiscal Capacity — Chosen allocation and likely continuity
[EN] Extended Fiscal Capacity — Mandatory shared program
[EN] Extended Fiscal Capacity — High shared return
[EN] Extended Fiscal Capacity — Equal own returns
[EN] Extended Fiscal Capacity — Less exclusion of the other group
[EN] Extended Fiscal Capacity — Approval by the other position

Figure 1.5: Demo includes the seven new conditions in both languages.

Rooms

Current rooms:

[ES] Inversión en capacidad fiscal y alternancia
[EN] Fiscal Capacity Investment and Political Turnover
[ES] Capacidad fiscal y alternancia: extendido
[EN] Fiscal Capacity and Political Turnover: extended

Figure 1.6: Rooms retains the four family rooms.

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.

Room: [EN] Fiscal Capacity Investment and Political Turnover

Create a new session

Session Config

[EN] Fiscal Capacity — one encounter

Number of participants

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

Create

[Configure session](#) 

App sequence

fiscal_capacity_game (4 rounds)

Investment in fiscal capacity when a political rival may control its future returns.

0 participants present

Start links

These URLs will stay constant for new sessions, even if the database is recreated.

Room-wide URL

Here is the room-wide URL anyone can use. Don't use this link when testing in multiple tabs on the same browser, because all tabs will be assigned to the same participant, using a cookie.

http://localhost:8135/room/fiscal_capacity_en

Figure 1.7: The basic room selects a basic configuration in the corresponding language.

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 Core facts

Purpose	Study how political continuity and the distribution of returns shape current investment in fiscal capacity.
Experimental unit	A pair consisting of Groups A and B, each represented by one participant.
Participants	Two people per pair; the session requires an even number of participants.
Basic edition	One encounter, four encounters with a fixed pair and rotating roles, or four encounters with reassignment and rotating roles.
Extended edition	Benchmark, likely turnover, inclusive benefits, secure government, persistent capacity, external finance, political competition, and discretionary use. Eight original conditions and seven allocation conditions: choice, continuity, mandatory provision, shared return, indifference, exclusion, and approval.
Decision	A invests 0, 10, or 20 ECU; selected variants add a competition decision by B or a capacity-use decision by the government. The new module adds spending composition and, where applicable, approval.
Payoff	Endowments, retained budget, contributions, governing benefits, political expenditure, and administrative costs as defined by the condition.
Topics	fiscal capacity; public investment; political turnover; common interest; spending composition; taxation.
JEL	A22; C92; D72; H11; H20; H41.
Suggested duration	35–50 minutes for a basic session; 60–90 minutes to compare two extended conditions.

The proposed instructor route is <https://fiscalcapacity.beer-lab.org/demo>. The stable basic English room is https://fiscalcapacity.beer-lab.org/room/fiscal_capacity_en.

Extended rooms appear in the access chapter. Before class, verify that the domain displays only this family, its 36 configurations, and its four rooms.

1.3 Learning objectives

By the end of the activity, students should distinguish a current tax or contribution from an investment that expands future ability to collect resources or implement policy. They should understand that the group paying the cost today may not control the asset tomorrow, which creates a commitment problem. They should also calculate expected payoffs, explain the role of continuity probability, and identify why an inclusive allocation rule can support investment even when turnover remains possible.

A second objective is to prevent automatic associations. High investment does not establish that an institution is democratic, fairly distributed, or beneficial to every group. High revenue does not necessarily indicate high capacity if it comes from a temporary measure. The debrief should treat efficiency, distribution, and political control as separate dimensions.

Theoretical foundation

The central question is intertemporal: how much will a group invest today in a durable institution when another group may control it tomorrow? Technology turns investment into capacity; politics determines who receives the return; the fiscal rule determines who pays. The three pieces must be read together.

1.4 Minimum classroom sequence

1. Before students arrive, open <https://fiscalcapacity.beer-lab.org/demo>, select language, edition, and treatment, and create a session with an even number of participants.
2. Project only the page with participant links or access codes. Do not reveal the instructor report.
3. Ask students to enter, remain silent, read the rules, and complete the comprehension check. The practice example does not affect payoffs.
4. Once everyone has finished, open the report. Check progress and denominators first, and then use the reveal control.
5. Project the investment distribution before announcing the theoretical prediction. Ask students to explain choices of 0, 10, and 20 ECU.
6. Derive expected payoffs and compare the observed pattern with the assigned institution. End by distinguishing description, compatible mechanism, and causal conclusion.

Checkpoint

Five conditions should hold before starting: correct domain, four family rooms, intended language, even participation, and no reuse of participant links from an older session. If any condition fails, create a fresh session before distributing links.

1.5 Pedagogical preparation

Write only four objects on the board: k , T , A's governing probability, and the benefit. Do not announce an underinvestment hypothesis before choices have been collected. Prepare a table with the three k options and resulting capacity: 0 produces 20, 10 produces 50, and 20 produces 80. If the class has not studied expected value, reserve five minutes to explain that a probability weights possible outcomes but does not guarantee an exact frequency in a small sample.

Decide whether ECU will remain teaching points or be converted into incentives. The application does not impose a monetary conversion. In a no-payment class, points remain the outcome defined by the rules and support strategic comparison. If payments are used, announce in advance how an encounter will be selected and how ECU will be converted.

Platform access, rooms, and family isolation

2.1 Route from the laboratory website

The institutional route begins at <https://beer-lab.org/>. From there, users enter the teaching catalog at <https://teaching.beer-lab.org/>. The “Fiscal Capacity Investment and Political Turnover” card leads the instructor to the family domain. Students should not browse through /demo; they receive a stable room route or an individual link generated for the session.

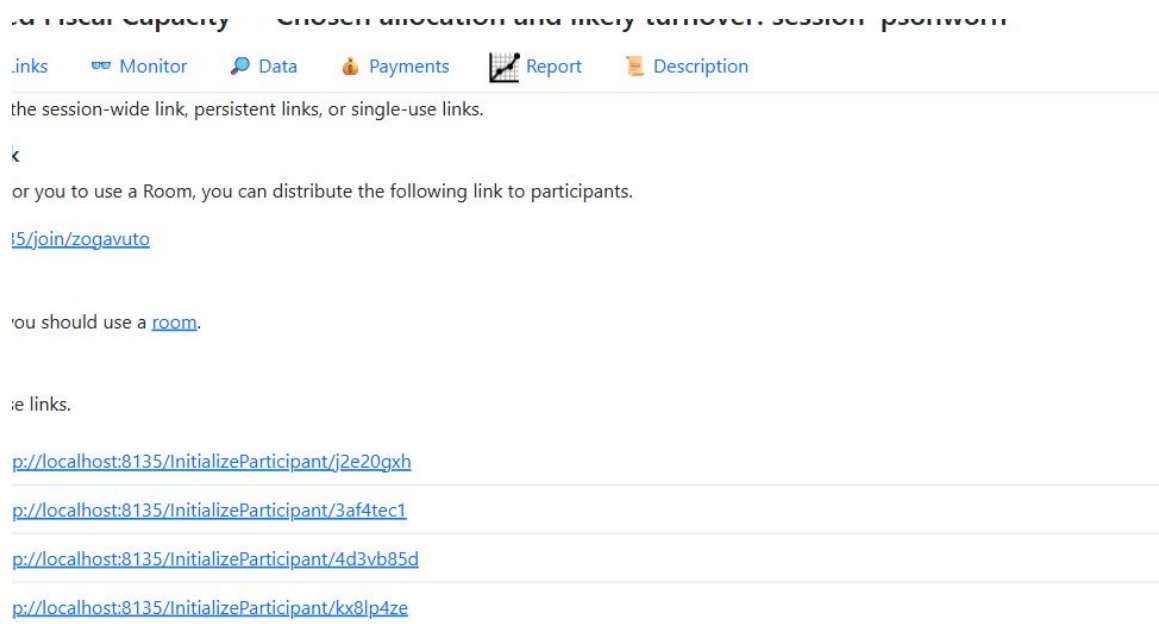


Figure 2.1: Use individual links from the session just created.

Domain separation serves both pedagogy and control. A student who receives a fiscal-capacity link should not be able to choose a trust game, an auction, or another family. In production, Sessions and Data should also belong to a distinct process and database. If /demo shows another family, do not begin the activity; ask the laboratory coordinator to verify family selection and deployment.

2.2 The four rooms

The proposed stable routes are:

- Spanish basic: https://fiscalcapacity.beer-lab.org/room/capacidad_fiscal_es;
- English basic: https://fiscalcapacity.beer-lab.org/room/fiscal_capacity_en;
- Spanish extended: https://fiscalcapacity.beer-lab.org/room/capacidad_fiscal_extended;
- English extended: https://fiscalcapacity.beer-lab.org/room/fiscal_capacity_extended.

The basic room contains one encounter, four encounters with a fixed pair, and four with reassignment. The extended room contains eight four-encounter conditions. Room names are exact prefixes for their configurations, and basic-room filtering excludes the extended suffix. This prevents an extended treatment from being selected by default.

Attention

An individual participant link belongs to one session. If the database is recreated, the session is deleted, or the instructor launches another session, an old link may report that the participant does not exist. Return to the stable room, create a new session, and distribute its links. Refreshing the expired URL does not repair it.

2.3 Creating and monitoring a session

In `/demo`, choose the configuration and participant count. If attendance is odd, arrange a laboratory backup terminal or reduce the count before creating the session; do not leave a participant without a counterpart. The next page generates individual links. Distribute them through the laboratory's normal method and keep the session page open.

The report displays completed and pending decisions while suppressing response aggregates until the instructor reveals them. This status identifies a stalled terminal. Do not equate connected participants with completed encounters: an encounter requires all applicable decisions and settlement for both roles.

The participant experience

3.1 Welcome and laboratory rules

The welcome screen carries the BEER Lab identity, describes the academic setting, and provides a clear start button. The following screen asks participants to confirm silence, privacy, attention to on-screen instructions, and private requests for technical help. These rules reduce unauthorized communication and preserve comparability.

What participants will see

Participants learn that the activity concerns investment, public resources, and turnover. They are not told that the purpose is to demonstrate underinvestment, and no choice is labeled selfish, efficient, or correct. Neutral wording avoids suggesting the behavior the class will later discuss.

3.2 Instructions and timing

The instructions define two groups, a 100 ECU endowment for each, and an additional 40 ECU budget controlled by A. A selects $k \in \{0, 10, 20\}$. Capacity is $T = 20 + 3k$. In the benchmark, each group contributes $T/2$ and the government receives $2T$. The government is drawn only after investment.

The sequence is substantive. The investment cost is incurred first; capacity is created second; the government is determined third; contributions and benefits are allocated last. If an instructor presents the realized government before explaining the investment, a choice under uncertainty is mistakenly turned into a choice under certainty.

3.3 Comprehension and practice

The comprehension check asks for T when $k = 10$, each group's contribution when $k = 20$, and whether investment is paid once. Correct answers are 50, 40, and yes. Error feedback supplies the formulas for another attempt but gives no strategic recommendation.

The practice example uses $k = 10$: capacity is 50, each group contributes 25, and the governing group receives 100. Ask one student to narrate it: A retains 30 of the special budget, both groups contribute 25 later, and only the government receives 100. A verbal account often catches confusion missed by a multiple-choice answer.



Welcome

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

In this activity, you will make decisions within an institution involving investment, public resources, and political turnover between two groups.

General laboratory rules

- Remain quiet throughout the activity.
- Do not talk to or communicate with other participants.
- Follow only the instructions shown on your screen.
- Raise your hand if you encounter a technical problem.
- Make your decisions individually and privately.
- Do not refresh, close, or leave the page during the activity.

☐ I confirm that I have read and accept these rules.

Start

Figure 3.1: Welcome, laboratory rules, and individual acceptance.



Instructions

Benchmark: likely continuity and concentrated benefit

Resources and unit of account

Each participant's starting account: 100 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.

The institution

Each encounter brings together Groups A and B. One person represents each group. Both begin with 100 ECU.

Group A also controls an initial budget of 40 ECU. It chooses how much—0, 10, or 20 ECU—to invest in fiscal capacity. Any amount not invested remains in its account.

Investment determines future capacity $T = 20 + 3k$. A mechanism then determines which group governs. In the benchmark, A governs with 75% probability and B with 25%.

1

A chooses investment k .

2

Capacity T is created.

3

The government is determined.

4

Resources are collected and the benefit is allocated.

Condition in this session: Benchmark: likely continuity and concentrated benefit

A governs with 75% probability. Both groups contribute half of T and the government receives $2T$.

Fiscal capacity: $T = 20 + 3k$

Each group contributes $T/2$ in the benchmark.

The governing group receives a benefit of $2T$.

Continue

Figure 3.2: Reference instructions: accounts, investment, and the government lottery.



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

Comprehension questions

Benchmark: likely continuity and concentrated benefit

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.

Under the benchmark rule, if A invests 10 ECU, what is fiscal capacity T?

Your answer: 40. The correct answer is 50. Review the formulas. With $k = 10$, $T = 50$; with $k = 20$, $T = 80$ and each group contributes 40. The investment cost is paid only once.

Under the benchmark rule, if A invests 20 ECU, how much does each group contribute when all capacity is used?

Is the investment cost paid only once within the encounter?

Continue

Figure 3.3: Feedback corrects the wrong question and retains other answers.

Practice example

Benchmark: likely continuity and concentrated benefit

This example does not affect your payment. Suppose A invests 10 ECU.

Investment 10 ECU Budget retained: 30 ECU	Fiscal capacity 50 ECU In the benchmark, each group contributes 25 ECU.	Benefit generated 100 ECU The governing group receives 100 ECU.
--	---	---

Notice the difference between investing today, contributing later, and receiving the benefit if your group governs.

Continue

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

Powered by oTree

Figure 3.4: Reference example without monetary consequences.

Checkpoint

Do not proceed while participants confuse the investment budget with the fiscal contribution. The additional 40 ECU belongs to A and finances k ; the contribution $T/2$ is deducted later from both groups. These are distinct accounting events.

3.4 Role, decision, and wait

Each encounter clearly identifies whether the participant represents A or B. In repeated modes, roles rotate so that treatment comparisons do not confound individual preferences with a permanent position. A sees three decision cards reporting investment, retained budget, capacity, and anticipated contribution. B waits while A chooses and receives no signal about an unconfirmed choice.

Waiting does not reveal whether the counterpart invested much or little. If a terminal remains here, inspect aggregate progress rather than inviting participants to compare screens. Under reassignment, one delay can temporarily affect another match in the next round, so troubleshooting should occur through the instructor view.

3.5 Government, result, and completion

After investment, the application displays the government, the announced probability, and available capacity. The server stores the draw. The result screen separates retained budget, contribution,

Your role in this encounter

Encounter 1 of 1



Role

Group A

In addition to the starting account, A has the 40 ECU budget. A chooses investment and retains what is not invested.

Benchmark: likely continuity and concentrated benefit

A governs with 75% probability. Both groups contribute half of T and the government receives 2T.

[Continue](#)

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

Powered by [oTree](#)

Figure 3.5: A receives the additional budget and chooses investment.

Investment decision

Encounter 1 of 1

Choose how much of the initial 40 ECU budget to invest.

0 ECU

Budget retained: 40 ECU

Fiscal capacity: 20 ECU

Contribution by each group: 10,0 ECU

10 ECU

Budget retained: 30 ECU

Fiscal capacity: 50 ECU

Contribution by each group: 25,0 ECU

20 ECU

Budget retained: 20 ECU

Fiscal capacity: 80 ECU

Contribution by each group: 40,0 ECU

[Continue](#)

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

Powered by [oTree](#)

Figure 3.6: A compares investment, retained budget, capacity, and contributions.

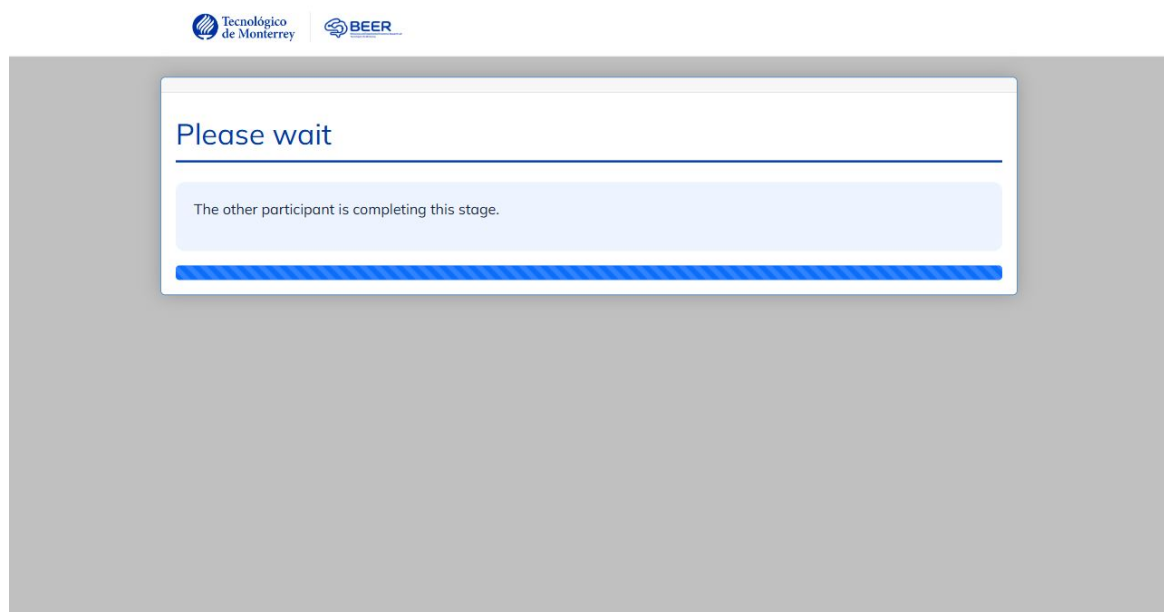


Figure 3.7: Neutral waiting while the counterpart decides.

Activity completed

Benchmark: likely continuity and concentrated benefit

You have completed all encounters. Please remain quiet while the instructor prepares the results discussion.

Cumulative total

80 ECU

Encounter	Role	Investment	Fiscal capacity	Governing group	Contribution	Benefit	ECU earned
1	Group A	20	80	Group B	40	0	80

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

Powered by oTree

Figure 3.8: Explicit completion with the cumulative account.

benefit, additional cost, and encounter payoff. This decomposition lets participants reconstruct the calculation rather than accepting an unexplained total.



Government and available capacity

Encounter 1 of 1

Governing group Group B	Fiscal capacity 80 ECU	Announced probability for A 75%
-----------------------------------	----------------------------------	---

The server conducted the draw and stores it in the data export.

[Continue](#)

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

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Figure 3.9: Realized government, available capacity, and announced probability.

The final screen explicitly confirms completion and asks participants to remain quiet while the instructor prepares the discussion. It replaces a technical “No more pages left” endpoint. Repeated modes also display encounter history and cumulative ECU. Figure 3.7 contrasts the two states so an instructor can distinguish a terminal still awaiting its counterpart from one that completed correctly.



Encounter result

Encounter 1 of 1

Investment 20 ECU Fiscal capacity: 80 ECU	Governing group Group B Probability that A governs: 75%	Resources collected 80 ECU Benefit generated: 160 ECU
Your contribution 40 ECU	Benefit you receive 0 ECU	Your payoff in this encounter 80 ECU

Role	Group A
Budget you retain	20 ECU
External financing	0 ECU
Administrative cost	0 ECU
Additional decision cost	0 ECU
Sum of group payoffs	300 ECU

Continue

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

Figure 3.10: Individual outcome and the sum of pair accounts.

Benchmark economic model

4.1 Objects and payoffs

Let $k \in \{0, 10, 20\}$ be A's investment. Fiscal technology is

$$T(k) = 20 + 3k.$$

The term 20 represents inherited capacity and $3k$ the expansion created by institutional expenditure. Each group begins with 100 ECU. A also controls a 40 ECU budget, pays k , and retains $40 - k$. In the benchmark, each group contributes $T/2$. The governing group receives $2T$.

Define $I_A = 1$ if A governs and zero otherwise. Payoffs are

$$\begin{aligned}\pi_A &= 100 + 40 - k - \frac{T}{2} + 2TI_A, \\ \pi_B &= 100 - \frac{T}{2} + 2T(1 - I_A).\end{aligned}$$

The probability that $I_A = 1$ is q . In the benchmark, $q = 0.75$. The draw changes who receives the benefit, but it cannot change capacity after investment has been made.

Theoretical foundation

Fiscal capacity is not the rate applied in one encounter. It is an institutional asset that determines what can be mobilized under the rules. Investment, collection, and use are distinct concepts. The discretionary-use treatment separates them directly.

4.2 A's expected value

Before the draw, A compares expected payoffs. Since A receives $2T$ with probability q ,

$$E[\pi_A] = 140 - k - \frac{T}{2} + 2qT.$$

Substituting $T = 20 + 3k$ gives

$$E[\pi_A] = 140 - k - \frac{20 + 3k}{2} + 2q(20 + 3k).$$

The marginal change from one additional unit of k is

$$-1 - \frac{3}{2} + 6q = -2.5 + 6q.$$

Investment raises A's expected payoff whenever $q > 5/12$, approximately 0.417. At benchmark $q = 0.75$, the slope is 2 and A prefers $k = 20$. Under likely turnover, $q = 0.25$, the slope is -1 and A prefers $k = 0$. Because choices are discrete and the expression is linear, risk-neutral expected-payoff maximization has no interior optimum.

4.3 B's expected value

B does not pay k , but contributes half of T and receives the benefit when A does not govern:

$$E[\pi_B] = 100 - \frac{T}{2} + 2(1 - q)T.$$

The marginal effect of k on B is

$$-\frac{3}{2} + 6(1 - q) = 4.5 - 6q.$$

At $q = 0.75$, the slope is zero, so B expects 100 ECU at every investment. At $q = 0.25$, the slope is 3, so B would like A to build maximum capacity. Conflict arises because the actor choosing the investment and the actor expecting to benefit need not coincide.

4.4 Joint surplus

Adding payoffs eliminates the identity of the beneficiary:

$$\pi_A + \pi_B = 240 - k - T + 2T = 240 - k + T = 260 + 2k.$$

Joint surplus increases with k . Maximum investment generates 300 ECU and minimum investment 260. Thus $k = 20$ is efficient in total even when A privately prefers not to invest under likely turnover. The wedge between private incentive and joint surplus is the commitment problem at the heart of the activity.

Attention

Do not call $k = 0$ irrational without stating the treatment, beliefs, and preferences. At $q = 0.25$, risk neutrality and concentrated benefits make it A's expected-payoff-maximizing choice. At $q = 0.75$, it may reflect risk aversion, a different interpretation, or distributional concerns.

4.5 Complete maximum-investment example

If $k = 20$, A retains 20, $T = 80$, and each group contributes 40. If A governs, it receives the 160 benefit: $\pi_A = 100 + 20 - 40 + 160 = 240$ and $\pi_B = 100 - 40 = 60$. If B governs, $\pi_A = 100 + 20 - 40 = 80$ and $\pi_B = 100 - 40 + 160 = 220$. Total surplus is 300 in either state.

At $q = 0.75$, A's expected payoff is $0.75(240) + 0.25(80) = 200$; B's is $0.75(60) + 0.25(220) = 100$. At $k = 0$, $T = 20$. A receives 170 if it governs and 130 otherwise, for an expected 160; B receives 90 or 130, for an expected 100. Moving from 0 to 20 therefore raises A's expected payoff by 40 while leaving B's expected payoff unchanged in the benchmark.

4.6 Inclusion and the political threshold

When $2T$ is divided equally, each group receives T . Then

$$\pi_A^{inc} = 140 - k - \frac{T}{2} + T = 140 - k + \frac{T}{2}, \quad \pi_B^{inc} = 100 + \frac{T}{2}.$$

A's slope is $-1 + 1.5 = 0.5$ regardless of who governs. At $k = 20$, A receives 160 and B 140. The total remains 300 but the gap narrows. Inclusion does not alter fiscal technology; it changes appropriation of its return.

4.7 Risk, utility, and behavior

The benchmark prediction maximizes expected ECU. With concave utility, the spread between 240 and 80 can make maximum investment less attractive even when its mean is higher. Participants may also dislike financing a rival, care about inequality, follow norms about taxation, or value control itself. One session does not identify which motive is responsible. Treatments change one component at a time to organize discussion, but a classroom sample is rarely large enough for structural estimation.

Feedback script

“First describe the choices: what share selected 0, 10, and 20? Second calculate which choice maximizes expected ECU under the announced probability. Third interpret which motives are compatible with deviations. Finally separate what we observed from what would require another condition or a larger sample.”

Theoretical foundations and evidence

5.1 What state capacity means

State capacity is the ability of a public organization to implement decisions: collect revenue, maintain records, enforce rules, provide goods, or administer information. Fiscal capacity is the specific ability to mobilize resources reliably. A high observed tax can result from an emergency without demonstrating durable administration, while a capable administration may choose a low rate. Legal, bureaucratic, and coercive capacity are related but distinct dimensions.

Besley and Persson (2009) model capacity as the result of prior investment. This perspective rejects the convenient assumption that a state can implement any chosen policy costlessly. A cadaster, registry, trained staff, and payment systems require current expenditure and create future possibilities. In the activity, k compresses that investment package and T represents its resulting capacity.

5.2 Turnover and commitment

Political turnover changes who controls an asset that survives today's decision. If the current group expects a rival to use capacity for exclusive purposes, it may invest less than is socially efficient. No myopia is required: the problem appears under perfect calculation. A promise by the rival to share future benefits would close the wedge only if it remained credible after the rival entered office.

Commitment institutions affect credibility. Rule-bound budgets, universal services, professional bureaucracies, and oversight can restrict how completely a new government redirects capacity. The inclusive treatment represents this idea in reduced form. It does not claim that a written promise is sufficient outside the laboratory; it invites students to identify mechanisms that make common allocation durable.

5.3 Common interests, cohesiveness, and inclusion

In state-capacity models, common-interest public goods raise the return to investment for multiple groups regardless of who governs. External defense, widely used infrastructure, or a universal health system can create this alignment. When benefits are transfers captured by the government, political cohesiveness is low. The activity compares these cases through concentrated and inclusive allocation rules.

“Inclusive” here refers only to the mechanical distribution of benefits. It is not a complete assessment

of participation, rights, or representation. State this scope explicitly so that a payoff treatment is not transformed into a normative judgment about real regimes.

5.4 Revenue, consent, and compliance

Levi (1989) treats revenue production as a political and administrative problem. Citizens may accept larger burdens when procedures are reliable, obligations appear reciprocal, and benefits are visible. The present activity fixes contributions to isolate investment; participants cannot evade. The separate tax-compliance family studies that decision.

This separation is useful. If a student says B would refuse to pay, acknowledge that as a hypothesis for another institution, then remind the class that collection is automatic here. Ask how evasion would feed back into investment: weak capacity may limit enforcement, and low compliance may reduce the return to building administration.

5.5 Historical and external evidence

Besley and Persson (2009) connect state-capacity investment with stability, cohesive institutions, and common-interest goods. Besley and Persson (2010) relate capacity, conflict, and development. Besley, Ilzetzki, and Persson (2013) analyze dynamic paths leading to common-interest, redistributive, or weak states. Dincecco and Katz (2016) document long-run relationships among fiscal centralization, limited government, and economic performance in Europe.

Historical evidence does not turn one classroom round into a cross-country causal test. Acemoglu, García-Jimeno, and Robinson (2015) also show that local state capacity can have direct and network spillover effects across Colombian municipalities. Real institutions therefore involve spatial and organizational complementarities omitted by a two-person activity. The game makes an incentive visible; it does not reproduce state formation in full.

For the instructor

Present the literature at two levels. The model supplies a mechanism: prior investment, future political control, and allocation of returns. Historical and empirical studies examine broader relationships with institutional data. Do not use one class's behavior to confirm or reject a country-level finding.

Basic editions

6.1 One encounter

Configuration `fiscal_capacity_en_one_encounter` minimizes learning and reputation. A choice reflects initial comprehension and preferences under the institution. This mode is appropriate for introducing the model or a 35-minute slot. Its limitation is that one A choice per pair yields little data and a random government draw can dominate students' impressions.

Use the histogram rather than the mean alone. A mean of 10 can mean everyone chose 10 or half chose each endpoint. Show expected and realized payoffs separately so that a favorable draw does not make a poor ex ante comparison appear strategically superior.

6.2 Four encounters with a fixed pair

Configuration `fiscal_capacity_en_4_fixed_pair` preserves the pair and rotates roles. Each person experiences choosing investment and receiving the consequences of someone else's choice. Repetition promotes arithmetic learning and can activate reciprocity even though communication is unavailable.

Each row is not an independent unit. Decisions within a pair share history. Display evolution descriptively and cluster by pair in formal analysis. Ask whether investment changes after a counterpart created high or low capacity, while avoiding causal claims from a few histories.

6.3 Four encounters with reassignment

Configuration `fiscal_capacity_en_4_random_pair` reassigns counterparts and rotates roles. It reduces targeted reciprocity and broadens contacts, but does not erase general learning or guarantee full independence. It supports a discussion of impersonal institutions: the rule continues while the person on the other side changes.

Compare fixed and reassigned modes only when treatment, size, and encounter count are held constant. Differences may reflect reputation, experience, or composition. Reassignment can also create different waiting patterns when one terminal is delayed.

Extended variants

All eight conditions share the welcome, common instructions, and data structure. The instructor need not repeat the entire activity. Announce the component that changes and request a comparative prediction. The extended benchmark allows two classroom groups to have the same horizon before a treatment comparison.

Checkpoint

A clean comparison assigns conditions before choices, holds other parameters constant, and analyzes averages at the experimental-unit level. Selecting two rounds after seeing the outcomes does not turn their difference into a causal effect.

7.1 Extended benchmark

Configuración: `fiscal_capacity_extended_benchmark`.

7.1.1 Mechanism

A chooses an investment of 0, 10, or 20 ECU; A governs with probability 0.75; each group contributes one half of capacity, and the governing group receives the entire benefit. This is the core institution from the basic edition, repeated four times with a fixed pair and rotating roles.

7.1.2 Prediction and economic logic

Maximum investment is optimal for A because the expected marginal return, $-2.5 + 6q$, is positive at $q = 0.75$. Turnover still matters: if B governs, A helps finance a capacity whose benefit is concentrated on the counterpart. The class should therefore distinguish a rational ex ante decision from an unfavorable ex post draw.

7.1.3 What to read in the report

Use the distribution of k as the common benchmark. Compare mean investment, the share choosing 20 ECU, the frequency with which A governs, and role-specific payoffs. In a small class, the realized A-government rate can differ sharply from 75 percent without indicating a programming error.

For the instructor

Ask first for the prediction under risk neutrality and expected-payoff maximization. Then ask why someone might choose 10 or 0. Answers often reveal risk aversion, confusion between probability and certainty, reluctance to finance a rival, or anticipated reciprocity. This condition establishes the vocabulary for every later comparison.

Foundation. A classroom adaptation of the political investment mechanism in Besley and Persson (2009, 2011); it is not a literal replication of a published protocol.

7.2 Likely political turnover

Configuración: `fiscal_capacity_extended_turnover`.

7.2.1 Mechanism

The technology and allocation rule remain unchanged, but A governs with probability 0.25. The treatment isolates the political security of the group that makes the investment. The cost is paid before the identity of the future government is known.

7.2.2 Prediction and economic logic

At $q = 0.25$, A's expected marginal return is $-2.5 + 6(0.25) = -1$. A therefore maximizes expected payoff at $k = 0$. B would benefit from greater capacity because it is likely to govern. Underinvestment arises from A's inability to appropriate the future return.

7.2.3 What to read in the report

Compare investment with the benchmark while keeping sample sizes visible. A decline in mean k and in the share choosing 20 is consistent with the turnover mechanism. Classify choices by the announced probability, not by the government eventually drawn.

For the instructor

Ask whether low investment proves that A is shortsighted. It does not: under these rules it can be a rational response to the prospect that a rival controls the asset. Connect the result to administrative reforms whose benefits survive the government that finances them.

Foundation. The comparison captures the logic of political stability and institutional cohesiveness in Besley and Persson (2009, 2011).

7.3 Inclusive benefits

Configuración: `fiscal_capacity_extended_inclusion`.

7.3.1 Mechanism

A retains the benchmark probability of governing, but the total benefit $2T$ is divided equally between A and B regardless of who governs. Political control remains visible, yet it no longer

determines who enjoys the return.

7.3.2 Prediction and economic logic

Each group receives T and contributes $T/2$. A's payoff is $140 - k + T/2$, which changes by $-1 + 1.5 = 0.5$ for each unit of k . A chooses 20 and B also gains from capacity. Inclusion aligns the investor's interest with joint surplus without eliminating turnover.

7.3.3 What to read in the report

Read investment, surplus, and the payoff gap together. High investment accompanied by a smaller A–B difference illustrates how distributional rules can support capacity while reducing conflict. Compare this treatment with both benchmark and turnover.

For the instructor

Use the treatment to separate fiscal capacity from partisan appropriation. A state may collect substantial revenue and still lack support when benefits are exclusive. Ask which real institutions could make inclusion credible: rule-based budgets, universal services, transparency, or legislative oversight.

Foundation. Inspired by common-interest public goods and inclusive political institutions in Besley and Persson (2009), and by Levi's (1989) discussion of fiscal consent.

7.4 Certain government by A

Configuración: `fiscal_capacity_extended_secure_government`.

7.4.1 Mechanism

A governs with certainty. Turnover risk disappears while productivity, contributions, and concentrated benefits remain unchanged. The treatment supplies a useful endpoint for secure appropriation.

7.4.2 Prediction and economic logic

With $q = 1$, A's expected marginal investment return is 3.5 ECU per unit of k , so 20 dominates. B finances half the capacity and never receives the concentrated benefit. Investment can be efficient in the aggregate and highly unequal in distribution.

7.4.3 What to read in the report

Compare investment and surplus with turnover, but display each role's payoff as well. High investment does not demonstrate legitimacy or benefits for both groups. The role chart can show high capacity and a large burden on B at the same time.

For the instructor

Pose two separate questions: which rule maximizes the total, and which rule would both groups accept? This keeps state capacity conceptually distinct from democratic quality. A secure ruler may invest heavily in machinery that serves narrow purposes.

Foundation. A comparative endpoint based on continuity and appropriation incentives in theories of institutional investment.

7.5 Persistent capacity

Configuración: `fiscal_capacity_extended_persistent_horizon`.

7.5.1 Mechanism

Investment is paid once and creates capacity in two periods: $T_1 = 20 + 3k$ and $T_2 = 20 + 2k$. A government is drawn and contributions and benefits are applied in each period. Lower second-period capacity represents depreciation.

7.5.2 Prediction and economic logic

Persistence raises the social value of the asset and A's expected value whenever A retains a sufficient governing chance. The sunk cost is compared with two streams of returns, making maximum investment more attractive than for a short-lived institution. A future government can inherit the administration built today.

7.5.3 What to read in the report

Show initial capacity, persistent capacity, total encounter surplus, and role-specific payoffs. Do not count the two periods as independent decisions: both arise from one choice of k . The experimental unit remains the assigned encounter or group.

For the instructor

Ask for examples of persistent state assets: cadasters, information systems, professional bureaucracies, or tax infrastructure. Then discuss depreciation, maintenance, and why short political horizons may discourage projects whose benefits arrive later.

Foundation. A dynamic classroom adaptation of durable state-capacity investment in Besley, Ilizetzi, and Persson (2013).

7.6 Partial external financing

Configuración: `fiscal_capacity_extended_external_revenue`.

7.6.1 Mechanism

An outside source finances one half of the program. The two groups jointly pay only the remaining half, while benefits are computed from total capacity. The productivity of k and the benchmark

governing probability remain unchanged.

7.6.2 Prediction and economic logic

A lower direct burden raises private payoffs and may strengthen investment incentives. The transfer is not free from a broader welfare perspective because the financier lies outside the experimental unit. The treatment shows how outside revenue changes the fiscal contract between citizens and the state.

7.6.3 What to read in the report

Read capacity, internal contributions, external finance, and group surplus separately. Do not treat the group total as including the outside financier's cost. If investment does not rise, participants may care more about political control of benefits than about tax cost.

For the instructor

Ask whether reliance on oil, aid, or intergovernmental transfers strengthens or weakens the relationship between taxpayers and government. Separate immediate budget relief from incentives to build a revenue administration and remain accountable.

Foundation. A teaching variant related to the literature on rents, taxation, and state formation; it should be used as a mechanism comparison, not as a replication of a country.

7.7 Endogenous political competition

Configuración: `fiscal_capacity_extended_endogenous_contest`.

7.7.1 Mechanism

After observing investment, B may spend 0, 10, or 20 ECU. This expenditure lowers A's governing probability from 75 to 50 or 25 percent. The expenditure is private, deducted from B's payoff, and creates no fiscal capacity.

7.7.2 Prediction and economic logic

B trades off paying for a greater chance to capture the benefit against retaining resources. Large capacity raises the political prize and can induce more contest expenditure. Anticipating this response, A may moderate investment. Capacity, office rents, and political conflict become jointly determined.

7.7.3 What to read in the report

Use the investment–expenditure display, mean political expenditure, and resulting governing probability. A positive association is not by itself causal because B responds to k . Causal comparison requires treatment assignment or exogenous variation in the prize.

For the instructor

Ask students to separate socially productive resources from resources dissipated in competition for control. The analogy does not require treating every campaign activity as waste; the mechanism is that a valuable office can redirect effort toward winning control rather than building shared institutions.

Foundation. An original extension inspired by models of distributive conflict and contests for political rents in Besley and Persson (2010, 2011).

7.8 Discretionary capacity use

Configuración: `fiscal_capacity_extended_discretionary_use`.

7.8.1 Mechanism

After the government is determined, the governing group chooses to use 0, 50, or 100 percent of capacity. Collected revenue creates the benefit but also a convex administrative cost $R^2/50$, where R is internally collected revenue.

7.8.2 Prediction and economic logic

Greater use raises benefits linearly and cost at an increasing rate. The optimal choice depends on capacity, allocation, and who bears the cost. Investment and use are no longer synonymous: a broad administration can be built and then only partly employed.

7.8.3 What to read in the report

Examine k , the use rate, collected resources, administrative cost, and role payoffs together. Unused capacity is a substantive outcome, not an error. Compare rates as well as amounts because R changes mechanically with T .

For the instructor

Ask students to distinguish building, financing, and using an institution. A tax law, registry, or bureaucracy can exist without every instrument being used at full intensity. Discuss idle capacity, compliance costs, and administrative limits.

Foundation. A teaching treatment that separates investment from the exercise of capacity; the convex cost is an original simplification that makes intensity choice visible.

Common interest and spending composition

8.1 The new decision and teaching question

The extension adds a decision after capacity is built and the realized government is known. In the original conditions, the concentrated or inclusive rule fixed the destination of benefits. Discretionary use changed how much revenue was collected. This module collects all capacity and lets the controller choose its composition: part finances a shared program and the remainder finances an allocation benefiting primarily the governing group. Initial investment and the purpose of its return are decisions at different stages and may be controlled by different people.

The central question is what return the investor expects when another position may later decide who benefits. Greater capacity expands spending possibilities, but its profitability for A depends on future decisions. Compare political continuity, the productivity of the shared program, and the institution restricting or approving allocation separately. Low investment alone does not identify opposition to the state or to common goods: it may respond to the private return available under this institution.

The module contains seven new conditions per language, each with one encounter. The twenty-two existing configurations retain their names, mechanisms, and one- or four-encounter formats. The full family now has thirty-six configurations: three basic and fifteen extended per language. Each new encounter includes the complete economic sequence; it is not a repeated horizon and does not accumulate capacity across sessions. Assign pairs to different rules and keep common instructions constant when comparing conditions.

8.2 Resources, sequence, and accounts

Each person starts with 100 ECU. A additionally controls a 40 ECU budget, invests $k \in \{0, 10, 20\}$, and retains $40 - k$. Capacity is $T = 20 + 3k$. The public lottery then selects A with probability p and B with probability $1 - p$. Investment does not change these probabilities in this module. No tax rate is chosen: each person contributes $T/2$, so total revenue equals T .

The controller chooses $x \in \{0, 1/2, 1\}$. The shared program receives $G = xT$ and the governing-group allocation receives $P = (1 - x)T$. Each person obtains gG from the shared program. The remaining allocation generates $2P$ for the controller and sP for the other position. Parameter s changes material exclusion without assuming a psychological motive. Returns are deterministic once the government lottery and allocation have been realized.



Instructions

Chosen allocation and likely turnover

Resources and unit of account

Each participant's starting account: 100 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.

The institution

Each encounter brings together Groups A and B. One person represents each group. Both begin with 100 ECU.

Group A also controls an initial budget of 40 ECU. It chooses how much—0, 10, or 20 ECU—to invest in fiscal capacity. Any amount not invested remains in its account.

The probability that A governs in this session is 25%.

1

A chooses investment k .

2

Capacity T is created.

3

The government is determined.

4

T is collected and its allocation is determined.

Condition in this session: Chosen allocation and likely turnover

A governs with probability 25%. Each shared ECU generates 1.5 for each group; each remaining ECU generates 2 for the governing group only. Allocation is chosen after investment.

Fiscal capacity: $T = 20 + 3k$

All capacity T is collected; each group contributes $T/2$. The governing group assigns 0%, 50%, or 100% of T to a shared program. Each ECU in that program generates 1.50 ECU for each group. The remainder generates 2 ECU per ECU for the governing group and 0 ECU for the other group. Benefits are added to accounts; the 40 ECU budget is not charged again.

Continue

Figure 8.1: Allocation-module rules: technology, lottery, and returns.

$$\pi_A = 140 - k - T/2 + gG + \begin{cases} 2P & \text{if A governs,} \\ sP & \text{if B governs,} \end{cases}$$

$$\pi_B = 100 - T/2 + gG + \begin{cases} sP & \text{if A governs,} \\ 2P & \text{if B governs.} \end{cases}$$

The joint account is $240 - k - T + 2gG + (2 + s)P$. The initial 40 ECU budget appears once in 240. Tax contributions finance the program and generated benefits are added to accounts; do not subtract investment again after computing $40 - k$. Generated benefits are not a third initial endowment. This identity checks an outcome even when choices depart from the monetary benchmark.

Checkpoint

With $k = 10$, $T = 50$, B in government, $x = 1/2$, $g = 1.5$, and $s = 0$, each person contributes 25. The shared program receives 25 and returns 37.5 to each group; the remaining 25 generates 50 for B. A receives $100 + 30 - 25 + 37.5 = 142.5$ and B receives $100 - 25 + 37.5 + 50 = 162.5$. Their sum is 305, also $240 - 10 - 50 + 125$.

8.3 Monetary prediction and identified comparisons

With $g = 1.5$ and $s = 0$, a shared-program ECU returns 1.5 to the controller, while a governing-group ECU returns 2. A controller maximizing only own ECU therefore chooses $x = 0$ when approval is unnecessary. This holds whether A or B governs. The shared program generates more joint benefit, returning three ECU across the two people, but the social comparison does not determine the controller's individual choice.

If $x = 0$ is anticipated, A's expected account is $140 - k + (2p - 1/2)(20 + 3k)$. Its slope in k is $6p - 2.5$. At $p = .25$ the slope is negative and investment zero is optimal; at $p = .75$ it is positive and investment twenty is optimal. The probability is known before investment, while observed government is a subsequent realization. A favorable draw can raise the payment of someone who chose a monetarily suboptimal investment without changing the prior prediction.

Condition	$E[\pi_A \mid k = 0]$	$E[\pi_A \mid k = 10]$	$E[\pi_A \mid k = 20]$
Chosen allocation, $p = .25$	140	130	120
Continuity, $p = .75$	160	180	200
Mandatory shared program	160	180	200
High shared return	180	230	280
Less exclusion	147.5	148.75	150
Approval by other position	150	155	160

Each row uses its monetary continuation. Values are A's expected accounts, not joint payments or classroom results. Identical investment columns under continuity and a mandatory program do not make their mechanisms equivalent: returns depend on governing in one case, while shared benefits arrive regardless of the lottery in the other. Also compare composition, B's account, and inequality.



Use of collected resources

Encounter 1 of 1

Governing group: **Group B** · Resources collected: **80 ECU**

Observe the realized government and choose how to allocate resources. The table shows final accounts if each option is implemented.

All capacity T is collected; each group contributes T/2. The governing group assigns 0%, 50%, or 100% of T to a shared program. Each ECU in that program generates 1.50 ECU for each group. The remainder generates 2 ECU per ECU for the governing group and 0 ECU for the other group. Benefits are added to accounts; the 40 ECU budget is not charged again.

Percentage for the shared program	Resources for the shared program	Resources for the governing group allocation	A's payoff	B's payoff
0%	0 ECU	80 ECU	80 ECU	220 ECU
50%	40 ECU	40 ECU	140 ECU	200 ECU
100%	80 ECU	0 ECU	200 ECU	180 ECU

0%

Percentage for the shared program

50%

Percentage for the shared program

100%

Percentage for the shared program

Continue

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

Figure 8.2: The controller compares resource destinations and resulting accounts.

Chosen allocation is the new reference: $p = .25$, $g = 1.5$, and $s = 0$. Continuity changes only p to $.75$. The mandatory shared program imposes $x = 1$ while retaining $g = 1.5$ and $p = .25$; it requests no spending decision and must not be recorded as voluntary generosity. High shared return changes only g to 2.5 : the controller now prefers the shared program and A anticipates a large return even without governing. Less exclusion changes only s to $.5$: the controller still selects $x = 0$, but A receives some benefit when B governs and A's marginal investment return becomes slightly positive.

Theoretical foundation

Mandatory provision versus chosen allocation separates imposed inclusion from chosen provision. Chosen allocation versus high shared return separates program value from political continuity. Less exclusion changes observable monetary benefits; it does not measure hostility, identity, or unelicited distributive preferences.

A shared need or an external threat may motivate a higher program value, following the common-interest mechanism in Besley and Persson. The high-return condition represents that channel through g ; it does not implement war, random damage, strategic defense, or catastrophe. Discuss those applications after play while keeping the implemented rule distinct from its economic interpretation.

8.4 Indifference and multiple continuations

Equal own returns uses $g = 2$ and $s = 0$. Each ECU generates two for the controller under either destination. All three percentages are optimal under monetary preferences. Do not silently choose a continuation and announce that investment must be low. Always concentrating supports investment zero; always sharing supports investment twenty. Investment ten can also be supported if continuation shares after investment ten and concentrates after the other investments.

Continuation enumeration distinguishes three investment levels and two government realizations: six future decisions, each with three optimal responses. The $3^6 = 729$ selections can support $k = 0, 10$, or 20 . The application records choices without imposing a tie-breaking rule. First ask students to identify the controller's indifference, then A's dependence on continuation. An observed distribution can inform a descriptive explanation, but it does not retrospectively remove the model's multiplicity.

8.5 Approval and the fallback allocation

In the approval condition, the controller proposes a percentage and the other position approves or rejects it. Rejection implements $x = 1/2$. Capacity already exists, investment is not refunded, and resources are not destroyed. Under reference parameters, the nongoverning position rejects a zero proposal because the fallback is better, and approves a hundred proposal because it exceeds the fallback. Approving and rejecting fifty implement exactly the same allocation.

The controller prefers implementing fifty to a hundred. It can propose fifty, or propose zero and receive a rejection; both routes implement fifty under the monetary benchmark. Distinguish multiple proposals from a unique implemented allocation. A's expected account rises with investment, making twenty its monetary optimum. The report and data record the proposal, response, and implemented percentage separately.

This institution represents agreement between two positions. It permits discussion of how broadening participation in a decision changes returns to building capacity. It is not a complete legislature:



Approval of the proposal

Encounter 1 of 1

Governing group: Group B

Proposed percentage for the shared program: 0%

The table compares approving the proposal with rejecting it. Rejection implements the 50% rule; it does not destroy resources.

Response from the other position	Implemented percentage for the shared program	A's payoff	B's payoff
Approve	0%	80 ECU	220 ECU
Reject	50%	140 ECU	200 ECU

Approve

Implemented percentage for the shared program: 0%

Reject

Implemented percentage for the shared program: 50%

Continue

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

Figure 8.3: The other position compares the proposal with the 50% fallback.

there is no endogenous party formation, bargaining over multiple portfolios, or formation of minimum winning coalitions. Its result depends on a specific fifty-percent fallback. Replacing that fallback with zero or with budget destruction changes the game and requires another analysis.

8.6 Report interpretation and additional exercises

Illustrative tests used two pairs in each language: one invested twenty and assigned zero to the program; the other invested zero and assigned a hundred. These are test decisions, not empirical results or representative student behavior. Mean investment is ten, mean capacity fifty, and mean joint account 290. The simple mean percentage is fifty, but the program received twenty of the hundred ECU collected: the resource-weighted percentage is twenty. The difference arises because encounters have different capacities.

In the Spanish capture, A governs in the twenty-investment pair, producing accounts 240 and 60. The other pair receives 160 and 120. Mean position accounts are 200 and 90. In the English capture, B governs in the first pair, producing 80 and 220; mean position accounts are 120 and 170. Rules and choices are equivalent across languages; the government draw differs. Do not attribute a difference produced by this realization to translation.

Feedback script

Ask who invested, who ultimately controlled allocation, and how much went to each destination. Reconstruct one A account and one B account. Then ask why a fifty-percent mean does not imply half of collected resources. Close by comparing an automatic rule, free choice, and a choice subject to approval.

1. **Ex ante comparison.** With concentrated spending and $p = .25$, raising investment from zero to twenty lowers A's expected account from 140 to 120. Greater capacity does not compensate its cost and the larger contribution when the other group concentrates returns. Joint resources nevertheless increase from 260 to 300.
2. **Changing purpose.** With $k = 20$, $g = 1.5$, and mandatory sharing, A receives 200 and B 180 regardless of who governs. Their sum is 380. Remove the lottery from these account calculations, while retaining it in the institutional sequence.
3. **Approval and rejection.** With $k = 20$, B governing, and proposal zero, approval produces 80 for A and 220 for B. Rejection produces 140 and 200. A prefers rejection. A fifty-percent proposal would produce the same accounts under either response.
4. **Cost of exclusion.** With $s = .5$, A's expected slope is $-1 + 3[2p + s(1 - p) - .5] = .125$ at $p = .25$. An additional ten ECU of investment raises its expected account by only 1.25. Consider comprehension and decision noise before interpreting an observed departure as a strong preference.
5. **Inference.** Choosing a hundred when $g = 2$ is a monetarily optimal response, as is choosing zero. It cannot automatically be classified as an altruistic departure from a strict concentration prediction.

For a short class, compare chosen allocation with mandatory sharing. For an advanced class, add high return and approval; reserve indifference for equilibrium correspondences. Assign one condition per pair and compare compatible denominators.

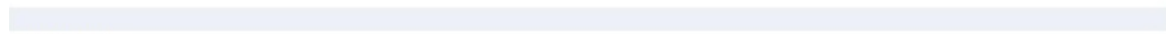
Investment distribution

N = 2 observations

0 ECU · 1



10 ECU · 0



20 ECU · 1

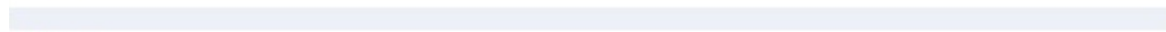
**Distribution of the implemented percentage**

N = 2 observations · Destination choices requested: 2

0% · 1



50% · 0



100% · 1



Mean shared percentage per encounter

50%

Resource-weighted shared percentage

20,0%

Resources for the shared program

10,0 ECU

Resources for the governing group allocation

40,0 ECU

Approval responses

0

Rejected proposals

0

N counts settled encounters, including mandatory allocations. Destination choices exclude the automatic rule. The weighted percentage uses collected resources as weights. Approving and rejecting a 50% proposal implement the same allocation.

Figure 8.4: Distributions: simple and resource-weighted percentages.

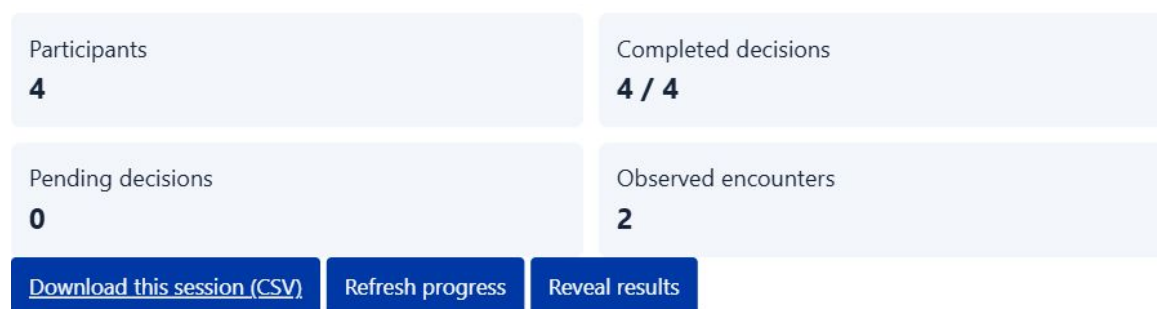
Instructor report and classroom feed-back

9.1 Controlled revelation

The report opens with results hidden. It displays participant count, completed decisions, pending decisions, and observed encounters. The instructor reveals aggregates explicitly. Revelation is possible with pending observations, but denominators must be checked and results kept out of sight of people still deciding. The download button selects this session and retains pending participants.

Instructor report: fiscal capacity and political turnover

Chosen allocation and likely turnover



Aggregates include settled encounters only. They can be revealed while other participants are pending; a missing response is never counted as zero.

Figure 9.1: Before revelation: participants, progress, and selected-session download.

If observations remain pending, identify whether they belong to an incomplete pair. Do not interpret the mean before checking its denominator. A ten-participant, four-encounter session can generate up to twenty investment observations because only A chooses in each pair and round. Those twenty rows are not necessarily twenty independent units.

9.2 Main indicators

Mean investment uses the sum of A choices divided by complete encounters with an investment. Mean capacity averages $20 + 3k$. The maximum-investment share can be calculated from the histogram by dividing choices of 20 by all observed investments. The A-government frequency is the number of completed draws won by A divided by all completed draws.

Instructor report: fiscal capacity and political turnover

Chosen allocation and likely turnover

Participants 4	Completed decisions 4 / 4	
Pending decisions 0	Observed encounters 2	
Download this session (CSV)	Refresh progress	Hide results

Aggregates include settled encounters only. They can be revealed while other participants are pending; a missing response is never counted as zero.

Investment and turnover overview

Mean investment 10 ECU	Mean capacity 50,0 ECU
Resources collected 50,0 ECU	Mean surplus 290,0 ECU
Mean Group A payoff 120,0 ECU	Mean Group B payoff 170,0 ECU
A governs 0,0%	Mean capacity use 100%

Figure 9.2: Revealed report: investment, revenue, and accounts by position.

Mean surplus averages $\pi_A + \pi_B$ across encounters. Role-specific means use the same complete encounters, separated into A and B. Under political competition, mean expenditure uses B's applicable decisions. Under discretionary use, mean use is calculated over governments that faced that choice. A zero denominator should appear as no data rather than a behavioral zero.

9.3 Histograms and evolution

The histogram reports frequencies at 0, 10, and 20 ECU. Bars reveal polarization concealed by a mean. Encounter evolution can suggest learning, fatigue, or response to history. Consistent A and B colors in payoff charts reduce role-switching errors during projection.

In a small class, describe before generalizing. Say “six of ten choices were 20” rather than “students always invest.” Treatment comparisons should report sizes, means, distributions, and assignment. Sessions held on different days can differ in course, time, and composition.

9.4 A five-step reading routine

First verify progress and denominators. Second show the distribution without theory and collect explanations. Third derive the expected-ECU prediction. Fourth compare investment, realized government, surplus, and role payoffs. Fifth state a bounded conclusion: “the pattern is compatible with” or “the assigned comparison suggests,” depending on the design.

Feedback script

“Average capacity was the mechanical result of investment. Government identity was a later draw. We should not evaluate a choice only from who won. Let us compare the expected payoff at the decision, joint surplus, and realized distribution. What changes when turnover becomes more likely or benefits are shared?”

9.5 Treatment-specific screens

Under political competition, B receives an additional screen after observing investment. Three cards display expenditure, private cost, and the resulting probability that A governs. Under discretion, the additional screen belongs to the governing group and displays the use rate, revenue collected, and anticipated administrative cost. Both preserve the institutional header, one principal question, and visible consequences before confirmation.

The competition report links investment to expenditure and resulting probability. The discretion report links created capacity to use rate and cost. Do not combine both metrics on one scale: one is ECU spent on competition and the other is a percentage of capacity. Full screenshots remain in each guide's figures directory for consultation and visual quality control, while the body emphasizes common screens every instructor will use.

Class plans

10.1 A 50-minute session

Allocate five minutes to access and rules, eight to instructions and comprehension, ten to one encounter, five to pending decisions, fifteen to the report, and seven to closure. Use the one-encounter configuration. Before revealing, poll the predicted k . Then derive the threshold $q > 5/12$ and compare the histogram with theory.

Close with three propositions: capacity requires prior investment; turnover changes appropriation; an inclusive rule can align incentives. Do not attempt every variant. Assign a calculation at $q = 0.4$ and ask why total surplus rises with k .

10.2 An 80-minute standard session

Use four encounters with fixed pairs or reassignment. Reserve ten minutes for access, ten for rules and practice, twenty for play, five for contingencies, twenty-five for report and model, and ten for discussion. Display evolution and ask whether change resembles learning or response to shared history.

The fixed mode supports discussion of reciprocity; reassignment supports institutional impersonality. Do not compare the two if the class played only one. A counterfactual prediction can still be shown, but students should identify the data needed to evaluate it.

10.3 A 100-minute comparison

Randomly assign half the class to benchmark and half to turnover or inclusion. Keep four encounters and fixed pairs. Reveal each report separately, record mean investment, maximum-investment share, surplus, and payoff gap, and only then place columns side by side.

Turnover predicts lower investment. Inclusion predicts high investment and a smaller gap. Ask students which component changed and which remained constant. End with limitations: small groups, a classroom interaction, ECU, and a reduced-form institution.

10.4 An advanced political-economy session

Assign teams to benchmark, turnover, inclusion, and competition. Each team submits a prediction, expected-payoff table, and report interpretation. Exchange anonymized report summaries without

labels and ask teams which condition could have produced each pattern. Similar means can arise from distinct mechanisms.

Add an institutional-design exercise. Students propose a rule that raises investment without concentrating benefits and show its effect algebraically. Grade the clarity of the mechanism, payoff consistency, commitment requirements, and testable prediction.

Require each team to distinguish an observation from an inference. “Mean investment was 15” is an observation; “turnover reduced investment” needs an assigned comparison; “participants opposed taxes” is a claim about motivation that the activity does not directly identify. End by asking teams which additional treatment, belief measure, or replication would discriminate between their preferred explanation and the strongest alternative.

Questions, exercises, and assessment

11.1 Questions before revelation

1. Which choice maximizes joint surplus, and why?
2. What continuity probability makes A indifferent across investment levels in the linear model?
3. Why does observing B in government not change the ex ante quality of A's choice?
4. What histogram might high risk aversion generate?
5. How could an instructor distinguish a turnover response from misunderstanding?
6. Which real institution resembles an inclusive-benefit rule?

Collect answers before confirming them. Use the equations, comprehension check, and treatment structure to sort the explanations. Good experimental discussion preserves alternatives until the design supplies a comparison.

11.2 Worked quantitative exercises

11.2.1 Exercise 1: capacity table

Compute T , each contribution, and the government benefit for every benchmark k . At $k = 0$, $T = 20$, contribution is 10, and benefit is 40. At $k = 10$, they are 50, 25, and 100. At $k = 20$, they are 80, 40, and 160. The benefit is four times an individual's contribution because two groups each contribute half of T while government receives $2T$.

11.2.2 Exercise 2: realized payoffs

At $k = 10$, A retains 30. If B governs, A receives $100 + 30 - 25 = 105$, while B receives $100 - 25 + 100 = 175$. Total surplus is 280, equal to $260 + 2(10)$. If A governs, payoffs are 205 and 75; the total is unchanged.

11.2.3 Exercise 3: expected value

At $q = 0.75$ and $k = 10$, $E[\pi_A] = 0.75(205) + 0.25(105) = 180$. Values at $k = 20$ and $k = 0$ are 200 and 160. Increments are linear. B's expected payoff is 100 for all three options. This equality is specific to $q = 0.75$ and the assigned parameters.

11.2.4 Exercise 4: threshold

Set marginal return to zero: $-2.5 + 6q = 0$. Thus $q = 2.5/6 = 5/12$. Above this threshold A chooses 20; below it A chooses 0; at the threshold A is indifferent in expected ECU. A risk-averse participant may require a higher probability.

11.2.5 Exercise 5: inclusion

At $k = 20$, $T = 80$. Each group contributes 40 and receives 80 regardless of government. A retained 20, so $100 + 20 - 40 + 80 = 160$. B receives $100 - 40 + 80 = 140$. Inclusion reduces the gap relative to 240 versus 60 when A governs under concentrated benefits.

11.2.6 Exercise 6: changing probability

At $q = 0.25$, the possible A payoffs at $k = 20$ remain 240 and 80, but weights change: $E[\pi_A] = 0.25(240) + 0.75(80) = 120$. At $k = 0$, expected payoff is $0.25(170) + 0.75(130) = 140$. Turnover reverses A's private ranking even though surplus still favors 20.

11.2.7 Exercise 7: persistent capacity

If $k = 10$, $T_1 = 50$ and $T_2 = 40$. Investment costs 10 only once. Apply contributions and benefits in each period and sum. Common errors subtract k twice or use 50 in both periods. Depreciation is represented by the coefficient 2 in period two.

11.2.8 Exercise 8: discretionary use

Suppose $T = 80$ and use is 50 percent. Total internal collection is 40, or 20 per group. The generated benefit follows the application's rule, and administrative cost uses $R = 40$: $40^2/50 = 32$. Under full use, $R = 80$ and cost is 128. Convexity can make full exercise expensive.

11.3 Interpretation problems

If a class invests less under turnover, the pattern is compatible with a political commitment mechanism. It does not show that students distrust a real party. If choices are equal under inclusion and benchmark, the result does not prove distribution irrelevant: both rules may induce the maximum or the sample may be small. If political expenditure rises with k , B may be responding strategically, but the within-sequence correlation is endogenous.

Keep realized and expected outcomes separate. A participant who chose 20 and lost government did not necessarily choose poorly; the low-probability state occurred. A participant who chose 0 and retained government did not establish that 0 maximized expected value.

11.4 Short-answer rubric

An excellent answer defines capacity, identifies future-control risk, calculates expected payoffs, separates efficiency from distribution, and limits inference. It includes at least one verifiable calculation and names the institutional rule generating the result. It earns the highest level even

when it does not match the class majority, provided that its assumptions are explicit and its logic is consistent.

An adequate answer gives the correct comparative direction and recognizes turnover but omits a key assumption, fails to separate realized outcome and expected value, or discusses surplus without distribution. A focused revision can ask the student to identify the decision moment and write the denominator of the reported measure.

An insufficient answer confuses investment and contribution, evaluates strategy only by the draw, attributes personal partisan motives to participants, or claims causality without assigned comparison. Feedback should assess consistency among rules, calculation, and conclusion rather than penalizing a preference.

Checkpoint

A complete revision should contain four elements: the treatment rule, a relevant calculation or comparison, evidence from the report, and a limit on the conclusion. When one is missing, return the answer with a focused question. This procedure evaluates economic reasoning without rewarding only the modal choice or a favorable random draw.

Operations, privacy, and contingencies

12.1 Incomplete participation

If one student is absent, do not invent a decision through the report. Reorganize before launch or use a staff-operated backup terminal. If disconnection occurs later, identify the link through monitoring and reopen it on the same terminal. Avoid restarting the server during a session because links and state depend on the active database.

12.2 Frequent problems

“Please wait” usually means the counterpart has not completed an active stage. If it persists, inspect pending counts. “Participant does not exist” usually indicates a link from an older database or session. “Not Found” may result from copying an expired participant path. Return to the stable room and generate a new session.

If `/demo` displays all game families, the instance is not isolated. If a basic room defaults to an extended configuration, inspect config prefixes. If debug information is visible, verify production mode and remove development-only template blocks.

12.3 Privacy and export

The report aggregates data and needs no names. Participant codes route screens but should not be projected next to choices. Exports should retain treatment, round, group, role, investment, capacity, government, payoffs, and treatment-specific decisions. Any link to grades or surveys should use an authorized procedure away from the public display.

Causal comparison must respect assignment. Record which participants received each treatment, how pairs were formed, and which encounters were incomplete. Do not treat repeated pair rows as independent individuals. Formal exercises should aggregate by group or use clustered uncertainty.

12.4 Visual accessibility

Project at a scale that makes axes and denominators legible. Color reinforces roles, but A and B labels preserve meaning for viewers with limited color discrimination. Read formulas aloud, never individual results. Allow additional time for comprehension without resolving an error by pointing to a participant’s terminal.

Attention

Do not run `resetdb`, recreate the database, or switch configuration while a session is active. Use a separate session or the local instance for testing. Production maintenance belongs outside class hours and requires a data backup.

12.5 Operational closing checklist

Before leaving the laboratory, confirm that every terminal displays “Activity completed,” hide the report if the projector will remain in use, and export data if the session belongs to a later comparison. Record the configuration, treatment, attendance, absences, terminal incidents, and any additional oral instruction. These notes make later interpretation possible without relying on memory.

Do not delete the session merely to clean the panel. Its history supports auditing, and the laboratory administrator applies the retention policy. Close tabs containing individual links and preserve only stable room routes in course materials. If ECU were converted to money, record the rule and selected encounter without adding names to a projected file.

For a comparative session, confirm compatible denominators across conditions before preparing slides. Report incomplete pairs as exclusions. A transparent difference based on a smaller sample is preferable to filling missing choices or mixing rows from another configuration.

Glossary and conceptual map

Capacity: an institutional ability to mobilize resources reliably. **Commitment:** sustaining a future rule even when the decision maker changes. **Common interest:** a benefit reaching groups regardless of political control. **Contribution:** the deduction applied after capacity is created. **ECU:** experimental currency unit. **External finance:** resources supplied by an actor outside the pair. **Government:** the group receiving or allocating benefits under the current rule. **Inherited capacity:** the 20 ECU available even at $k = 0$. **Investment:** a current cost that increases T . **Joint surplus:** the sum of A and B payoffs. **Office rent:** a benefit concentrated on the governing group. **Political turnover:** the possibility that today's investor will not govern tomorrow. **Retention probability:** A's announced chance of governing after investment. **Treatment:** an assigned rule that changes one institutional component. **Use:** the exercised share of capacity in the discretionary condition.

The conceptual map starts with k , which determines T . Probability and, in one condition, political expenditure determine government. The allocation rule determines who receives benefits. Financing determines who bears the contribution. Persistence adds periods, and discretion adds use intensity. Payoffs combine these branches; the instructor report makes them comparable.

Three arrows deserve special attention. The link from investment to capacity is a technological relationship fixed by the application. The link from capacity to government is not causal in the benchmark: the draw uses an announced probability. The link from government to benefit is an allocation rule. Confusing these arrows leads students to say investment “buys” government, which can arise only indirectly in the competition treatment through B's response.

Use the glossary at closure. Ask students to define one term, locate it on a participant screen, and identify its variable in the report. This exercise connects theoretical language, participant experience, and exported data.

13.1 Annotated references

Acemoglu, García-Jimeno, and Robinson (2015)

“State capacity and economic development: A network approach.” *American Economic Review*, 105(8), 2364–2409. The paper demonstrates local complementarities and network spillovers beyond an isolated pair.

Besley, Ilzetzki, and Persson (2013)

“Weak states and steady states: The dynamics of fiscal capacity.” *American Economic Journal: Macroeconomics*, 5(4), 205–235. It supports discussion of persistent capacity and institutional paths.

Besley and Persson (2009)

"The origins of state capacity: Property rights, taxation, and politics." *American Economic Review*, 99(4), 1218–1244. The main foundation for fiscal investment, stability, and common interests.

Besley and Persson (2010)

"State capacity, conflict, and development." *Econometrica*, 78(1), 1–34. It connects capacity, political conflict, and development.

Besley and Persson (2011)

Pillars of Prosperity: The Political Economics of Development Clusters. Princeton University Press. The book integrates capacity, turnover, and political cohesiveness.

Dincecco and Katz (2016)

"State capacity and long-run economic performance." *Economic Journal*, 126(590), 189–218. Historical evidence on fiscal centralization, limited government, and performance.

Levi (1989)

Of Rule and Revenue. University of California Press. Revenue mobilization as a political, administrative, and compliance problem.

These works support related mechanisms rather than an identical protocol. Parameters 100, 40, 20, 3, and the discrete choices were selected for classroom transparency. Cite the activity as a BEER Lab teaching adaptation when incorporating it into course materials.

13.2 Implementation card

Family	fiscalcapacity; application fiscal_capacity_game.
Proposed subdomain	https://fiscalcapacity.beer-lab.org/ .
Instructor access	https://fiscalcapacity.beer-lab.org/demo .
Rooms	capacidad_fiscal_es; fiscal_capacity_en; capacidad_fiscal_extendida; fiscal_capacity_extended.
Configurations	36: six basic and thirty extended.
Group size	Two participants; attendance must be even.
Report	Progress, investment, capacity, government, surplus, role payoffs, political expenditure, use, and histograms.
Topics	fiscal capacity; public investment; political turnover; common interest; spending composition; taxation.
JEL	A22; C92; D72; H11; H20; H41.
Authorship	Stanislao Maldonado, Department of Economics, Tecnológico de Monterrey, Monterrey Campus.
Contact	stanislao.maldonado@tec.mx .

Checkpoint

The package is operationally ready when the instance shows 36 configurations, four rooms, successful HTTP responses, compiled guides, hidden and revealed reports, and no other game families. The public domain remains a proposed route until the server team configures DNS, process, and separate database.