



Instructor's Guide to Electoral Systems

Laboratory implementation, theoretical foundations,
experimental evidence, and variants

Behavioral and Experimental Economics Research Lab
Department of Economics



Revised edition | October 2026

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

How to use this guide

This guide supports the preparation, implementation, and classroom discussion of the family of electoral systems and strategic voting activities available through the Behavioral and Experimental Economics Research Lab (BEER Lab) at the Department of Economics of Tecnológico de Monterrey. It is intended for instructors with different levels of familiarity with experimental and behavioral economics.

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

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

Author

This guide was prepared by Stanislaw 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

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

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Preparation and access

1.1 What this family teaches

An election transforms individual preferences into a collective outcome through a decision rule. Two electorates with identical preferences can produce different outcomes when the rule changes or when voters change their ballots. This activity makes both mechanisms observable. Participants receive private payments associated with three alternatives, A, B, and C, and vote in electorates of nine. Institutional comparisons retain these alternatives and payment schedules while changing available information or the method used to count ballots.

The activity supports courses in political science, social choice, game theory, and political economy. The instructor need not introduce Nash equilibrium before students play. Students first need to understand that payment depends on the collective outcome and that their ballot contributes to determining it. After the activity, distinguish preferences, expectations, and actions. This sequence makes strategic reasoning a subject of discussion without recommending a ballot before observing actual decisions.

Candidates do not choose whether to enter, select platforms, run campaigns, or negotiate coalitions. A, B, and C remain available throughout the activity and do not represent actual parties. The exercise does not measure students' personal political attitudes. Payment schedules induce preferences within an experimental environment. This scope lets the instructor study how voters respond to institutions while keeping ideological identities, party knowledge, and policy preferences outside the mechanism.

For the instructor

Choose the teaching question before choosing configurations. Compare a single election and a runoff to distinguish plurality from absolute majority. Compare plurality, approval, and Borda to study preference expression. Compare private composition, public composition, and an intention poll to discuss expectations. Use proportional treatments to distinguish representation from exclusive victory. A class does not need to run every available treatment.

1.2 Activity summary

Purpose	Compare how electoral rules and information transform preferences and ballots into collective outcomes.
Experimental unit	Nine-voter electorate: four prefer A, three prefer B, and two prefer C.
Basic edition	One election; ten with a fixed electorate; ten with rematching and stable individual preferences.
Extended edition	Basic modes, a six-election reference, runoff, approval, Borda, public composition, intention polls, and proportional representation with or without a threshold.
Decision	One alternative, an approval set, or a complete ranking, depending on the rule.
Payoff	Private 30, 20, and 0 ECU schedule; winning alternative or payment weighted by ten seat shares.
Topics	Electoral systems, strategic voting, social choice, voting rules, proportional representation, electoral information.
JEL	A22, C72, C92, D71, D72.
Suggested duration	Classroom estimate: 20–30 minutes for one election and discussion; 45–70 for a repeated comparison.
Participants	Multiples of nine; minimum nine, or eighteen with rematching.

These codes cover undergraduate teaching, noncooperative games, interactive laboratory experiments, social choice, and political processes. The topics match the institutional catalog. The following durations are planning estimates rather than measured pilot results: about 20–30 minutes for one election with discussion, and 45–70 minutes for a repeated institutional comparison. Actual duration depends on reading, comprehension, additional ballots, and the depth of the debrief. Reserve discussion time before allocating time to more treatments.

1.3 Navigation from the laboratory website

Begin at <https://beer-lab.org/> and select **CLASSROOM** on the English website, or **CLASE** on its Spanish version. This opens the teaching catalog at <https://teaching.beer-lab.org/>. Search for *Electoral Systems and Strategic Voting*; filters also allow searching by topic or JEL code. Clear filters from an earlier search if the card does not appear. The Spanish title is *Sistemas electorales y voto estratégico*. The catalog language and session language are separate choices.

Each card distinguishes Español and English. The extended-version selector changes the edition before following the relevant link. Each language and edition combination has its own room. Students receive only the room selected for their class session. They do not need to explore Demo, choose a configuration, or know administrative credentials. A room is a stable entrance. A session is a specific execution that stores its own participants, decisions, and outcomes.

The proposed instructor route is <https://electoralrules.beer-lab.org/demo>. Student routes are https://electoralrules.beer-lab.org/room/sistemas_electorales_es, https://electoralrules.beer-lab.org/room/electoral_rules_en, https://electoralrules.beer-lab.org/room/sistemas_electorales_extendido, and https://electoralrules.beer-lab.org/room/electoral_rules_extended. All four belong to this family. Demo contains 28 electoral-rule configurations and Rooms contains four rooms. Sessions and Data must also belong exclusively to this instance.

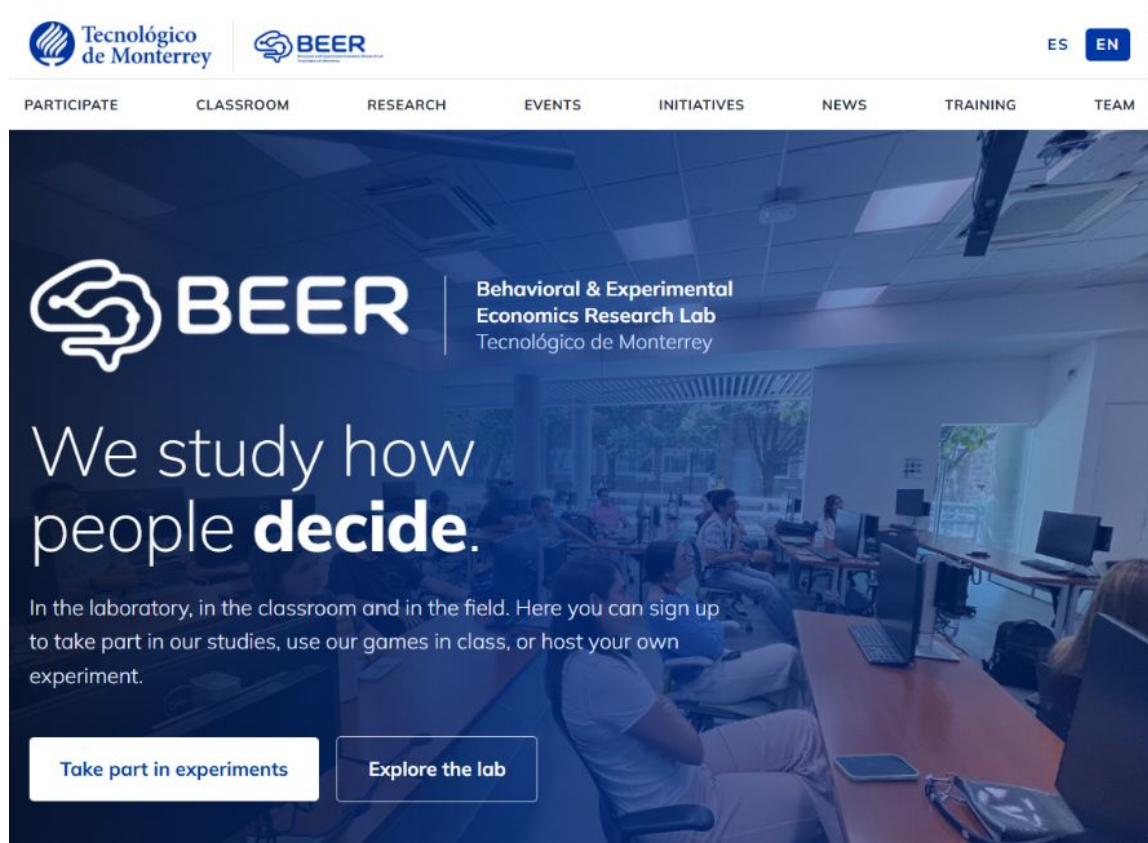


Figure 1.1: Current institutional website: the classroom menu opens teaching experiments. Screenshot from October 7, 2026.

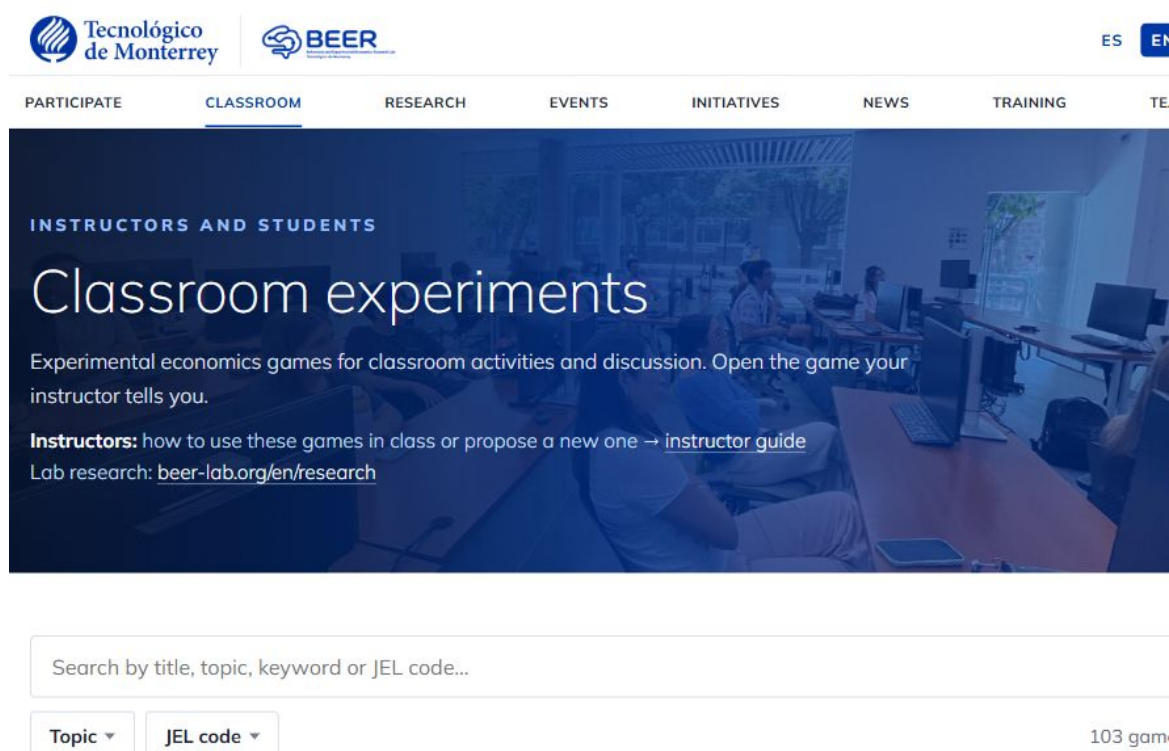


Figure 1.2: Institutional catalog: search by title, topic, or JEL and select language and edition.

Demo

[ES] Sistemas electorales y voto estratégico — Una elección
[ES] Sistemas electorales y voto estratégico — Diez elecciones, electorado fijo
[ES] Sistemas electorales y voto estratégico — Diez elecciones, reasignación
[ES] Sistemas electorales y voto estratégico — Extendido — Una elección
[ES] Sistemas electorales y voto estratégico — Extendido — Diez elecciones, electorado fijo
[ES] Sistemas electorales y voto estratégico — Extendido — Diez elecciones, reasignación
[ES] Sistemas electorales y voto estratégico — Extendido — Seis elecciones, pluralidad
[ES] Sistemas electorales y voto estratégico — Extendido — Segunda vuelta
[ES] Sistemas electorales y voto estratégico — Extendido — Aprobación
[ES] Sistemas electorales y voto estratégico — Extendido — Borda
[ES] Sistemas electorales y voto estratégico — Extendido — Composición pública
[ES] Sistemas electorales y voto estratégico — Extendido — Encuesta de intención
[ES] Sistemas electorales y voto estratégico — Extendido — Representación proporcional
[ES] Sistemas electorales y voto estratégico — Extendido — Representación proporcional con umbral
[EN] Electoral Systems and Strategic Voting — One election
[EN] Electoral Systems and Strategic Voting — Ten elections, fixed electorate
[EN] Electoral Systems and Strategic Voting — Ten elections, rematching
[EN] Electoral Systems and Strategic Voting — Extended — One election
[EN] Electoral Systems and Strategic Voting — Extended — Ten elections, fixed electorate
[EN] Electoral Systems and Strategic Voting — Extended — Ten elections, rematching
[EN] Electoral Systems and Strategic Voting — Extended — Six elections, plurality
[EN] Electoral Systems and Strategic Voting — Extended — Runoff
[EN] Electoral Systems and Strategic Voting — Extended — Approval
[EN] Electoral Systems and Strategic Voting — Extended — Borda
[EN] Electoral Systems and Strategic Voting — Extended — Public composition
[EN] Electoral Systems and Strategic Voting — Extended — Intention poll
[EN] Electoral Systems and Strategic Voting — Extended — Proportional representation
[EN] Electoral Systems and Strategic Voting — Extended — Proportional representation with threshold

Sistemas electorales y voto estratégico / Electoral Systems and Strategic Voting — BEER Lab

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

Figure 1.3: The isolated instance lists this family’s Spanish and English configurations.

Rooms

Current rooms:

Sistemas electorales y voto estratégico — Básico
Electoral Systems and Strategic Voting — Basic
Sistemas electorales y voto estratégico — Extendido
Electoral Systems and Strategic Voting — Extended

Figure 1.4: The four electoral-systems rooms: basic and extended editions in each language.

1.4 Creating a student session

Sign in using credentials assigned by the laboratory. Open Rooms, select the basic English room, and check that its creation form offers the three basic configurations. The initial choice should be one election rather than an extension. Select the treatment before creating the session. Do not change its rules after students start. For an instructor rehearsal, Demo provides individual test links for all nine participants; these links are useful for checking the sequence, not for distributing the teacher password.

Participant numbers must be multiples of nine. Fixed-electorate configurations accept nine, eighteen, twenty-seven, or more students in complete groups. Rematching requires at least eighteen because a single electorate would have no outside participants with whom to form different groups. An even number is not required: twenty-seven is valid, whereas twenty is not. Give students who do not complete a group a separate observation task; do not create fictional participants whose missing ballots block a wait page.

Checkpoint

Before sharing the student link, check language, edition, election horizon, and voting rule. Confirm complete groups of nine and the minimum of eighteen for rematching. Confirm how ECU are defined and whether any monetary conversion has been announced. Open a test participant link and check the welcome screen. Keep instructor access separate from the room link given to students.

Prepare the projector for the aggregate report, but keep results hidden while students decide. Allow enough time to read instructions and answer comprehension questions. Require silence and no direct communication between participants. The aggregate poll in its designated treatment is the only communication channel specified by that protocol; it does not authorize conversation. Do not ask students to announce private payment schedules or reveal their preferred alternatives before voting.

1.5 A suggested classroom schedule

A fifty-minute class can allocate five minutes to introduction and access, ten to instructions and comprehension, fifteen to elections, fifteen to debriefing, and five to an individual written response. A ninety-minute class can compare two rules, with a short interval for preparing the second session. Maintain one central question for each comparison. Running several treatments without time to understand their differences can make a technically successful activity pedagogically uninformative.

Room: Electoral Systems and Strategic Voting — Basic

Create a new session

Session Config

[EN] Electoral Systems and Strategic Voting — One election

Number of participants

Complete groups of 9 participants. Use a multiple of 9; minimum 9.

Create

[Configure session](#) 

App sequence

electoral_rules_game (10 rounds)

Original teaching adaptation of electoral rules with induced preferences.

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://127.0.0.1:8099/room/electoral_rules_en

Figure 1.5: Basic English room: select a configuration and a valid participant number.

Common rules and participant sequence

2.1 Induced preferences, resources, and experimental currency

Each participant receives a private payment schedule. A-preferring voters earn 30 ECU if A wins, 20 if B wins, and 0 if C wins. B-preferring voters earn 0, 30, and 20 respectively. C-preferring voters earn 20, 0, and 30. These amounts are conditional outcomes, not a budget to spend. There is no initial endowment to transfer to candidates, no voting fee, and no token that students must purchase to submit a ballot.

ECU means *Experimental Currency Units*. It is an accounting unit that allows comparison within the activity. Thirty ECU do not automatically mean thirty pesos or thirty dollars. If a session includes monetary incentives, the laboratory must announce the conversion and payment selection procedure beforehand. The program records experimental earnings for all active elections. Paying one randomly selected election externally requires a separately announced and implemented protocol; it is not performed automatically by these configurations.

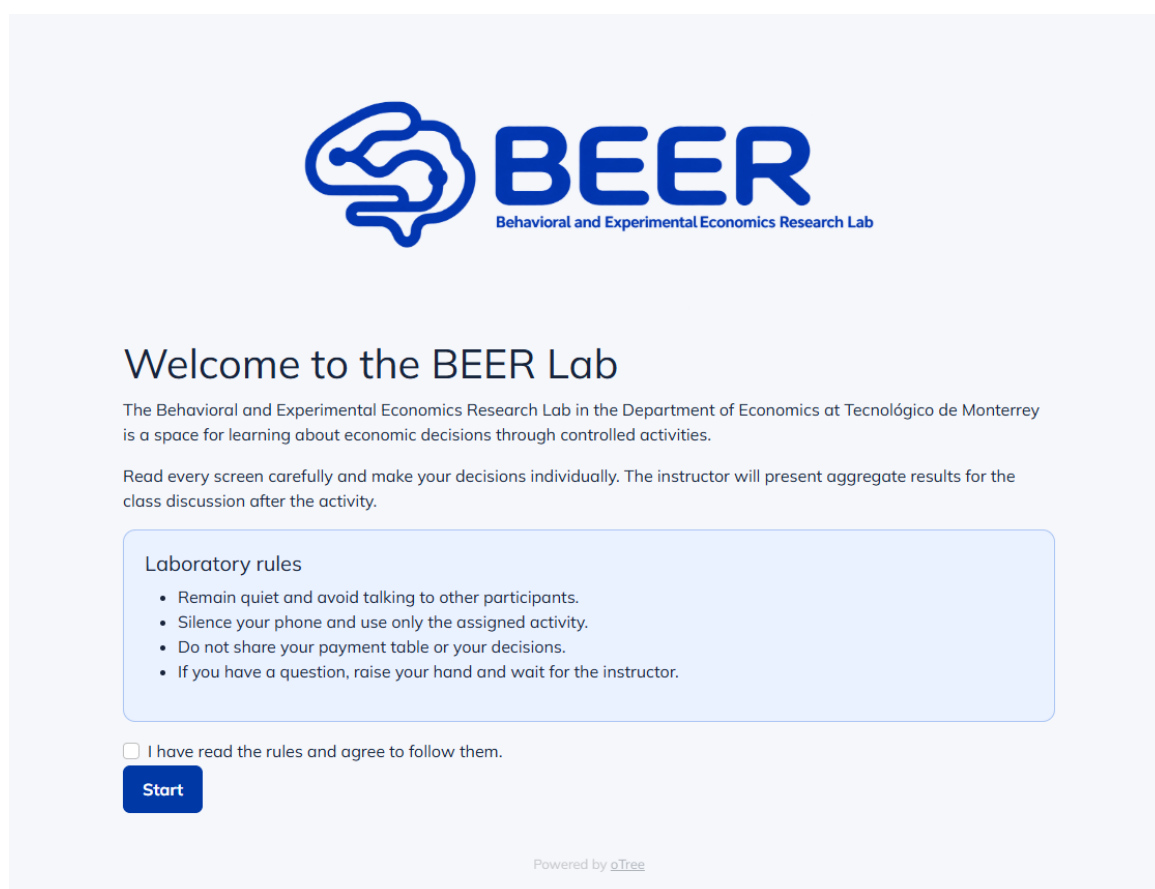
Preference type and number	A	B	C
A first: four voters	30	20	0
B first: three voters	0	30	20
C first: two voters	20	0	30

The instructor may use this full table after decisions are complete. In the basic treatment, each student initially knows only their own row, not the electorate's 4–3–2 composition. The public-composition treatment reveals all rows and their frequencies before voting, without identifying people. This is an experimental information difference. Preference types are randomly assigned when the session is created, and each person's schedule remains stable across elections.

2.2 Welcome and instructions

Before play, explain platform use, duration, and how payments are computed. After play, ask what outcomes students expected and which information they considered. When the same students experience multiple treatments, record their order. Students who begin with plurality enter Borda with prior experience. Alternating order between groups helps expose this issue, but it does not automatically turn a classroom exercise into a causal experiment. Keep descriptive learning and formal identification distinct.

The first screen presents the laboratory logo, teaching purpose, and general participation rules. Students accept those rules before continuing. The next screen explains the mechanism selected for the session. A prominent visual schedule shows payments for A, B, and C. Students can identify their favorite alternative directly rather than searching for an important number in a corner. Instructions distinguish outcome-contingent earnings from resources that can be spent.



BEER
Behavioral and Experimental Economics Research Lab

Welcome to the BEER Lab

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

Read every screen carefully and make your decisions individually. The instructor will present aggregate results for the class discussion after the activity.

Laboratory rules

- Remain quiet and avoid talking to other participants.
- Silence your phone and use only the assigned activity.
- Do not share your payment table or your decisions.
- If you have a question, raise your hand and wait for the instructor.

☐ I have read the rules and agree to follow them.

Start

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Figure 2.1: Institutional welcome and acceptance of laboratory rules.

What participants will see

Participants see their own 30, 20, and 0 ECU schedule, electorate size, and the rule determining the outcome. They do not see other participants' names or codes, or advice about which alternative to choose. Public composition reveals anonymous preference frequencies. The intention poll reveals aggregate declarations within the participant's own electorate. Neither identifies individual voters.

Fixed matching keeps the same nine participants together. Rematching reorganizes electorates while retaining four A-preferring, three B-preferring, and two C-preferring voters in each. Some encounters can repeat. Random rematching does not promise eight new counterparts every election, and it does not change the participant's payment schedule. This distinction matters because a change in companions and a change in preferences would otherwise be confounded.

2.3 Comprehension and individual correction

The comprehension check asks how many people form an electorate, what determines payment, and whether the private schedule stays unchanged if another election follows. The payment question is

BEER Lab · Election 1 of 1

How the collective decision is made

Resources and unit of account

Your private table: A = 0 ECU, B = 30 ECU, C = 20 ECU.

There is no endowment to spend; the collective outcome determines payment. Your table stays fixed and each election starts afresh.

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

This session does not convert ECU into real money.

Nine people choose an outcome among alternatives A, B and C. Your payment depends on the collective outcome and the table below. Each election starts afresh; your own payment table stays the same throughout the activity.

Your payment table

A	B	C
0 ECU	30 ECU	20 ECU

This table is private. Other people may have different payments.

Figure 2.2: Real English instructions: private payment schedule, counting rule, and calculation example. Primera parte.

The rule in this session

Mark one alternative. The alternative with the most votes wins; it need not receive more than half. A vote is required.

Ties are resolved by a recorded uniform random draw. A, B and C receive no priority advantage.

Available information

Before deciding you know only your own table, the rule and the group size. The number of people with each table is not disclosed.

The same nine people form your electorate in every election.

Counting example

In a hypothetical example with votes A: 5, B: 3 and C: 1, the single-ballot rule selects A. Your payment is the A entry in your own table, even if you voted for something else. This example explains counting; it does not recommend a choice.

Sequence

1. Read your table and the counting rule.
2. Submit the ballot required in this session. Submission is final.
3. Wait until all nine people have responded.
4. If another ballot is required, choose between the two finalists.
5. Read the result and your payment; wait for the instructor's discussion at the end.

[Continue](#)

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Figure 2.3: Continuation of the same participant instructions.

adapted for proportional representation: payment depends on the schedule weighted by seat shares rather than a single winning alternative. These questions check operational understanding. They do not ask students to solve for an optimal ballot, announce beliefs, or demonstrate familiarity with a theoretical term.

A wrong answer produces an explanation beside that question. If a student enters eight voters, the feedback identifies nine as the correct group size and explains where the ballot is counted. Correct answers remain selected. The student can correct the response and proceed. A comprehension mistake does not generate negative earnings or become a voting observation. This separation prevents misunderstanding from being treated as a deliberate economic choice.

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

BEER Lab · Election 1 of 1

Check the rules

How many people decide in your electorate?

8

Your answer: 8. The correct answer is 9. Every electorate contains nine voters; all nine ballots are required to calculate its result.

In an election with a single winning alternative, what determines your payment?

☒ My table and the alternative that wins.

☐ The alternative I mark, even if it loses.

Does your own payment table remain unchanged in later elections?

☒ Yes

☐ No

Continue

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Figure 2.4: Explanatory feedback for a wrong answer, with other correct responses retained.

If several students make the same mistake, review the operational example without recommending a vote. Ask how sending a ballot differs from determining the collective result. A person can vote for A and receive 20 ECU because B wins. This example addresses the common misconception that payment follows the selected radio button directly. In proportional treatments, demonstrate a short weighted calculation so that ten seats are not mistaken for ten additional elections.

2.4 Election reminder, ballot, and waiting

Each election begins with a reminder of the private schedule and progress. Under plurality, the participant sends one alternative. Approval asks yes or no for each alternative: approving none, one, two, or all three is valid. Borda requires a complete ranking without repetition. The platform validates submitted ballots and explains errors. An A, A, C ranking is rejected rather than silently completed as A, B, C.

After submission, a participant waits until all nine members complete the same stage. A wait page does not by itself indicate a broken server. The polling treatment first waits for intentions, displays their aggregate, and then collects consequential ballots. A runoff can require an additional

BEER Lab · Election 1 of 1

Prepare your ballot

Your payment table

A
0 ECU

B
30 ECU

C
20 ECU

This table is private. Other people may have different payments.

The rule in this session

Mark one alternative. The alternative with the most votes wins; it need not receive more than half. A vote is required.

Check your payments again. Each election uses new ballots, and the previous outcome consumes no resources.

Continue

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

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Figure 2.5: Private payments and election progress before submitting a ballot.

BEER Lab · Election 1 of 1

Submit your ballot

Your payment table

A
0 ECU

B
30 ECU

C
20 ECU

This table is private. Other people may have different payments.

Mark one alternative. The alternative with the most votes wins; it need not receive more than half. A vote is required.

Choose an alternative

☐ A

☒ B

☐ C

Continue

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

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Figure 2.6: A single-choice plurality ballot.

ballot involving only two finalists. That stage is skipped when one alternative receives more than half of the initial nine votes.

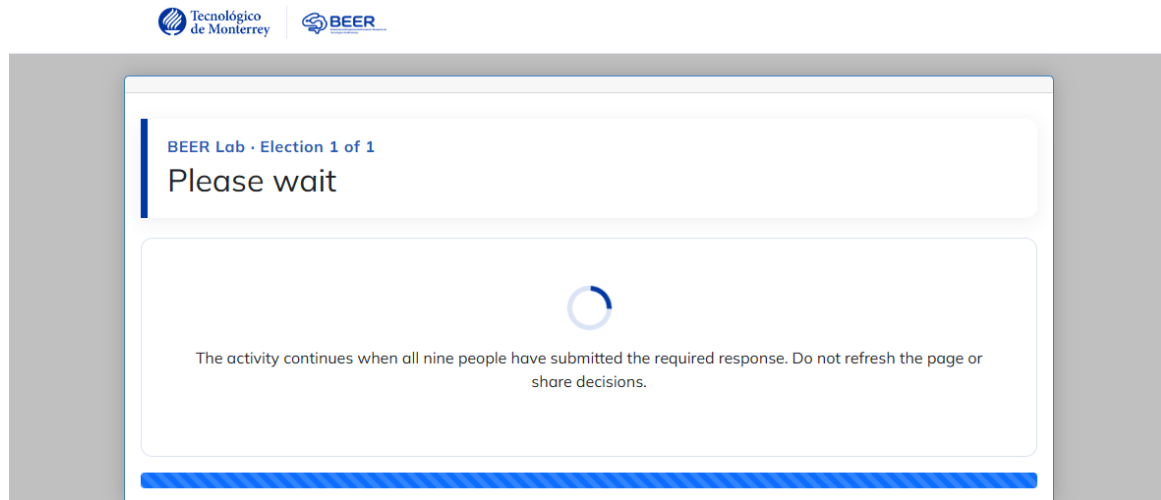


Figure 2.7: Waiting for all nine ballots in the electorate.

Rematching introduces a session-wide synchronization between elections. A fast electorate may wait for another before groups are recomposed. Do not create a replacement session or distribute new participant links to resolve a normal wait. Inspect progress from the instructor panel and determine whether somebody has not yet answered. Resetting the database during class invalidates links and records; it is not an appropriate response to synchronization.

2.5 Individual outcomes and explicit completion

The individual results page shows counts and the outcome of the participant's own electorate. Single-winner rules identify the selected alternative and the payment implied by the private schedule. Borda counts are points; approval counts are approvals. Proportional outcomes are seat allocations and weighted payments. These objects have different units and should not all be called votes. One electorate's outcome need not match the outcomes elsewhere in the class.

The final screen appears after the last active election, whether the configuration uses one, six, or ten. It has no continuation button leading to an empty page. Accumulated earnings add payments from active elections; they are not an initial balance or a debt. Students can leave this page open while the instructor prepares aggregate figures. Re-entering through another participant link risks creating a different participation rather than continuing the completed one.

BEER Lab · Election 1 of 1

Election result

Selected alternative A	Your payment in this election 0.00 ECU
----------------------------------	--

First-stage count

A 4	B 3	C 2
---------------	---------------	---------------

Votes

Payment uses your table and the outcome shown. Votes and counting points are not paid as ECU.

[Continue](#)

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

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Figure 2.8: Collective plurality result and individual experimental earnings.

BEER Lab · Election 1 of 1

Activity completed

Accumulated payment
0.00 ECU

You have completed the elections in this session. Remain at your station and wait for the instructor's directions for discussing the results.

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

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Figure 2.9: Explicit completion, accumulated experimental earnings, and instructions to await discussion.

Foundations and fully worked examples

3.1 Plurality, absolute majority, and collective preference

Plurality means receiving more votes than any rival. Absolute majority means receiving more than half of valid votes. With nine single-choice ballots, five constitute an absolute majority, whereas four can constitute a plurality. If all participants select their first preference, counts are $A=4$, $B=3$, and $C=2$. Plurality selects A even though five voters initially prefer another alternative. The difference is a property of the rule, not a calculation error.

The four A-preferring voters then receive 30 ECU each; the three B-preferring voters receive 0; the two C-preferring voters receive 20. Total experimental earnings are $4(30) + 3(0) + 2(20) = 160$ ECU and the mean is $160/9 \approx 17.78$ ECU. These are protocol calculations, not observed student data. Actual ballots may differ because participants make decisions rather than mechanically reporting preference types.

Theoretical foundation

The rule aggregates submitted actions rather than observing a unique collective will. An individual preference orders alternatives; a ballot is an admissible action. Comparing the two requires the payment schedule and decision rule. A 4–3–2 plurality result does not establish that A is preferred by a majority or that the five other voters share the same second choice.

Compare alternatives in pairs. Against B, A is preferred by the four A types and two C types, winning 6 to 3. Against C, B is preferred by the four A types and three B types, winning 7 to 2. Against A, C is preferred by the three B types and two C types, winning 5 to 4. Thus A beats B, B beats C, and C beats A. Each individual's order remains internally consistent throughout these comparisons.

3.2 The Condorcet cycle

A Condorcet winner would defeat every rival in a pairwise majority comparison. This activity's profile has no Condorcet winner; it has a cycle. Individual preferences are transitive, but the collective majority relation is not. The mechanism does not require inconsistent students or an arithmetic mistake. It arises because different voters have different orders, and the majority supporting one comparison is not necessarily the majority supporting another.

The cycle also illustrates agenda effects. Comparing A with B first selects A, which subsequently loses against C. Comparing B with C first selects B, which subsequently loses against A. Comparing C with A first selects C, which subsequently loses against B. These are board exercises rather than

implemented agenda-voting treatments. State that distinction so an instructor does not search for a configuration the application does not provide.

Do not describe A as a Condorcet loser: it defeats B. Do not assign this profile the exact structure of every classic three-candidate experiment. The teaching adaptation uses a cycle to expose conflicting collective comparisons. Published studies support questions and mechanisms, while the numerical results here follow this particular protocol. Keeping those roles separate permits a meaningful connection to literature without claiming a replication that has not been conducted.

3.3 Sincere voting, strategy, and best response

For a single-choice ballot, sincere voting selects the alternative with the highest private payment. A best response maximizes expected payment given others' actions or beliefs about them. These actions may coincide. Departing from a favorite could reflect strategic expectations, but it could also reflect misunderstanding, exploration, or a criterion other than maximizing induced monetary earnings. The descriptive measure therefore cannot identify motivation on its own.

At the sincere plurality profile 4–3–2, no voter strictly benefits by changing their ballot alone while the other eight keep theirs. An A type already receives the maximum 30. If a B type changes from B to C, counts become 4–2–3 and A still wins. Changing to A increases its margin but leaves the B type's payment at zero. A C type cannot make C catch A by unilaterally changing their own ballot.

This profile is a weak Nash equilibrium under knowledge of the other actions: some changes leave payment unchanged, but none increases it strictly. It is not necessarily the only equilibrium or the outcome selected in every classroom. If all four A types and all three B types vote B, counts are 0–7–2 and B wins. No one voter can change that outcome alone. Different outcomes can therefore be sustained, and learning need not select a unique one.

To teach equilibrium, specify the actions, hold eight fixed, and examine the ninth person's alternatives. To teach expectation formation, ask what information would allow a voter to anticipate those eight actions. Public preference composition does not reveal actual ballots, and repeated results do not reveal all individual decisions. These are different questions. An equilibrium calculation based on known ballots is a conditional benchmark rather than an assumption that participants actually possessed that knowledge.

3.4 Borda: ordinal information and a manipulation example

The sincere ranking is A–B–C for an A type, B–C–A for a B type, and C–A–B for a C type. A ranking gives two points to its first alternative, one to its second, and zero to its third. A receives $4(2) + 3(0) + 2(1) = 10$ points. B receives $4(1) + 3(2) + 2(0) = 10$. C receives $4(0) + 3(1) + 2(2) = 7$. A and B tie and each has an equal probability of selection.

An A type's expected payment from that tie is $(30 + 20)/2 = 25$ ECU. Suppose one A type submits A–C–B while the other eight rank sincerely. A retains its two points from that ballot; B loses one and C gains one. Scores become 10, 9, and 8. A wins and the deviating voter receives 30. The expected improvement of five ECU is a concrete manipulation under explicitly stated assumptions about other ballots.

This calculation does not imply that every ranking change is profitable. It must specify other participants' actions and the tie rule. Nor does it mean Borda measures preference intensity: the 2–1–0 points are imposed by an ordinal aggregation rule, while 30–20–0 are induced payments. They are different objects. Summing points as though they were ECU would confuse the ballot-counting

procedure with participants' earnings.

3.5 Runoff and first-ballot strategy

Sincere initial counts 4–3–2 send A and B to a runoff. The four A types and two C types prefer A to B, so sincere final ballots select A by 6 to 3. A B type receives zero. However, if one B type changes their initial ballot from B to C, initial counts become A=4, B=2, C=3. A and C now qualify. The initial ballot changes the menu faced in the final stage.

Against A, C is preferred by all three B types and both C types. Sincere final ballots therefore select C by 5 to 4. The B type who changed the initial ballot receives 20 rather than zero. This example shows why a runoff does not remove every incentive in the first stage: selecting finalists is itself consequential. The calculation assumes knowledge of others' preferences and their sincere behavior in the final stage.

Feedback script

Ask what changed. The voter's preference schedule stayed fixed, but their initial ballot changed the finalists. Then distinguish choosing the best available finalist from abandoning the original favorite strategically. If B is eliminated, voting C in the final stage can simply select that voter's best remaining option. It is not automatically evidence of a strategic sacrifice.

3.6 Proportional representation and experimental welfare

Proportional representation does not select one exclusive winner. It allocates ten seats using Hare quotas and largest remainders. At 4–3–2, quotas are $40/9$, $30/9$, and $20/9$. Integer parts assign four, three, and two seats, totaling nine. The remaining seat goes to A's largest remainder, $4/9$, compared with $3/9$ for B and $2/9$ for C. The final allocation is 5–3–2.

An A type earns $0.5(30) + 0.3(20) + 0.2(0) = 21$ ECU. A B type earns $0.5(0) + 0.3(30) + 0.2(20) = 13$. A C type earns $0.5(20) + 0.3(0) + 0.2(30) = 16$. Total earnings equal $4(21) + 3(13) + 2(16) = 155$. Holding five seats does not make A the exclusive winner, and it does not automatically give A-preferring voters 30 ECU. Every person's payment uses all allocated seat shares.

If B were the exclusive winner, total earnings would be $4(20) + 3(30) + 2(0) = 170$ ECU; a C victory would give $4(0) + 3(20) + 2(30) = 120$. Summing induced earnings uses cardinal comparability built into the exercise. This measure does not incorporate rights, political equality, legitimacy, minority representation, or government-formation costs. A higher sum addresses a particular experimental welfare question, not the complete normative superiority of an institution.

Treatments and comparisons

4.1 One election, fixed repetition, and rematching

The single election records a decision without prior experience within that session. Ten fixed-electorate elections keep participants, preference schedules, and institutions unchanged. Ten rematched elections keep individual preferences and 4–3–2 composition but probabilistically change companions. These basic modes also appear in the extended edition to facilitate comparisons from one room. They reuse the same experimental logic rather than adding a second implementation with potentially different payments.

Repetition makes earlier outcomes informative. Someone can learn that their favorite received few votes even if initially unaware of how many voters preferred it. Fixed groups can also develop shared expectations. Rematching weakens stable group membership but does not erase learning: each person retains their own history and knows the same rules. A difference between modes should not be interpreted as a pure measure of reputation or as an experiment with fresh inexperienced participants each election.

The extended reference uses six fixed-electorate plurality elections. The seven institutional extensions also use six fixed elections. This allows an instructor to compare rules without automatically giving one six learning opportunities and another ten. Use that reference when the main question concerns an institution. The ten-election versions remain appropriate when the teaching question concerns learning, experience, or group stability rather than a direct comparison of voting rules.

4.2 Runoff

Each voter first chooses A, B, or C. An alternative with at least five votes is elected immediately. Otherwise, the top two proceed. Qualification ties are resolved by a uniformly random priority recorded for that election. The final ballot includes only the finalists; their final counts determine payment. A separately drawn priority resolves any final tie. Students are told the tie mechanism, but priorities are not announced as a signal before voting.

The teaching question is whether separating qualification from final selection changes expectations and initial actions. Compare runoff frequency, outcomes, and earnings rather than merely counting screens visited. An election with two ballots still counts as one election. The previous chapter's deviation is a conditional demonstration, not a prediction that every voter discovers it. The same rule can generate different behavior when information or experience differs.

BEER Lab · Election 1 of 6

Second ballot

Your payment table

A 30 ECU	B 20 ECU	C 0 ECU
--------------------	--------------------	-------------------

This table is private. Other people may have different payments.

No alternative received more than half. Choose one of the two finalists. Your payment table is unchanged.

Choose an alternative

☐ A
☐ B

Continue

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

Powered by [oTree](#)

Figure 4.1: Additional ballot when no alternative obtained an absolute majority.

4.3 Approval

Each person approves or rejects each alternative independently; there is no fixed approval allowance. Approving none is valid and adds zero to all counts. If everyone does so, all alternatives tie and uniform random selection applies. Approving all adds equally to every count and does not change differences. Explain these possibilities as rules before play without telling students which approval set to use. Empty approval does not count as an absent participant.

There is no unique translation from an ordinal preference into a sincere approval set. As an explicit benchmark, suppose everyone approves alternatives yielding positive earnings. A receives six approvals, B seven, and C five, so B wins. If everyone approves only their favorite, counts are 4–3–2 and A wins. Both calculations expose the additional decision: where each voter places an approval cutoff. Neither is imposed automatically by the application.

The report counts ballots that fail to approve the favorite. It does not label approving a second alternative insincere. A zero rate can coexist with different winners because everyone may approve their favorite plus different additional alternatives. For richer discussion, examine exported approval patterns, separating inclusion of the favorite, number of approvals, and collective outcome. Total approvals can exceed nine, although the electorate still contains exactly nine people.

4.4 Borda

Every ballot orders all three alternatives and assigns two, one, and zero points. The application rejects duplicates and incomplete rankings. Comparing with plurality asks what changes when

BEER Lab · Election 1 of 6

Submit your ballot

Your payment table

A 0 ECU	B 30 ECU	C 20 ECU
------------	-------------	-------------

This table is private. Other people may have different payments.

Select Yes or No for each alternative. You may approve none, one, two or all three. The most approvals wins. Approving two alternatives does not divide a vote: each receives one full approval.

Do you approve A?

☐ Yes
☒ No

Do you approve B?

☒ Yes
☐ No

Do you approve C?

☒ Yes
☐ No

Continue

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

Powered by [oTree](#)

Figure 4.2: Approval ballot with separate choices for A, B, and C.

second preferences are expressed. Comparing with approval asks what changes when a complete order replaces a subset. Keep these contrasts separate. Changing a rule changes both the available actions and their aggregation, so a classroom pattern cannot automatically be attributed to only one component.

BEER Lab · Election 1 of 6

Submit your ballot

Your payment table

A	B	C
30 ECU	20 ECU	0 ECU

This table is private. Other people may have different payments.

Rank all three alternatives without duplicates. First place receives 2 counting points, second place 1 and third place 0. The highest total wins. Counting points are not ECU: your payment depends on the winning alternative.

First place

Second place

Third place

[Continue](#)

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

Powered by [oTree](#)

Figure 4.3: Complete Borda ranking: every alternative must appear exactly once.

The report counts rankings whose first position differs from the induced favorite. This measure does not detect every Borda manipulation. In the A–C–B example, the favorite remains first while the strategic change occurs between second and third. Therefore, a zero favorite-departure rate does not establish absence of strategy. The export retains the whole ranking, allowing an instructor to examine lower-position changes rather than infer them from winner counts alone.

4.5 Public preference composition

Plurality remains unchanged, but instructions disclose all three schedules and the 4–3–2 frequencies. Individual identities remain private. Comparing with the six-election reference changes initial information while holding schedules and counting constant. A student knows how many people share a favorite, but not what ballots those people will submit. Knowing preferences is different from knowing actions, particularly when the same voting game has multiple equilibria.

Ask whether information facilitates coordination, reduces uncertainty, or clarifies the limited impact of a unilateral ballot. A prediction about behavior needs assumptions about beliefs and equilibrium

BEER Lab · Election 1 of 6

How the collective decision is made

Resources and unit of account

Your private table: A = 30 ECU, B = 20 ECU, C = 0 ECU.

There is no endowment to spend; the collective outcome determines payment. Your table stays fixed and each election starts afresh.

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

This session does not convert ECU into real money.

Nine people choose an outcome among alternatives A, B and C. Your payment depends on the collective outcome and the table below. Each election starts afresh; your own payment table stays the same throughout the activity.

Your payment table

A	B	C
30 ECU	20 ECU	0 ECU

This table is private. Other people may have different payments.

Figure 4.4: Public-composition instructions reveal frequencies without identifying voters. Primera parte.

The rule in this session

Mark one alternative. The alternative with the most votes wins; it need not receive more than half. A vote is required.

Ties are resolved by a recorded uniform random draw. A, B and C receive no priority advantage.

Available information

The electorate contains four tables (A: 30, B: 20, C: 0), three tables (A: 0, B: 30, C: 20), and two tables (A: 20, B: 0, C: 30). No information identifies who holds each table.

The same nine people form your electorate in every election.

Counting example

In a hypothetical example with votes A: 5, B: 3 and C: 1, the single-ballot rule selects A. Your payment is the A entry in your own table, even if you voted for something else. This example explains counting; it does not recommend a choice.

Sequence

1. Read your table and the counting rule.
2. Submit the ballot required in this session. Submission is final.
3. Wait until all nine people have responded.
4. If another ballot is required, choose between the two finalists.
5. Read the result and your payment; wait for the instructor's discussion at the end.

[Continue](#)

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Figure 4.5: Continuation of the same participant instructions.

selection. Do not summarize the treatment as information always improving outcomes. Total earnings, winner frequencies, and the distribution of individual payments may change in different directions. Students can learn to distinguish an informational mechanism from a general claim that more disclosure is necessarily better.

4.6 A nonbinding intention poll

Before voting, each person declares A, B, or C as an intention. The platform gathers nine declarations and shows their aggregate to that electorate. Students then submit consequential ballots. The poll has no direct payment and does not bind later action. It occurs before every election. It shows the participant's nine-person electorate, not the whole class or other groups; this adaptation aligns information with the collective outcome that determines payment.

BEER Lab · Election 1 of 6

Nonbinding intention

Your payment table

A	B	C
20 ECU	0 ECU	30 ECU

This table is private. Other people may have different payments.

Before the final ballot, everyone reports a nonbinding intention among A, B and C. The system displays intention totals for this nine-person electorate without identities. You may change your choice on the final ballot. The intention has no direct effect on payments.

Which alternative do you currently intend to choose?

☐ A
☐ B
☒ C

[Continue](#)

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

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Figure 4.6: An intention declaration before the consequential ballot.

The comparison opens discussion of coordination and credibility. An intention may forecast one's action, signal to other voters, or express a preference. Because beliefs are not elicited, the program cannot identify these motivations. Compare intention and ballot for each person and election, and inspect whether poll and actual totals converge. Changing an intention does not automatically indicate deception or irrationality. It can be a response to information learned from the poll itself.

4.7 Proportional representation with and without a threshold

The no-threshold treatment distributes ten seats among alternatives with positive votes. The threshold treatment requires at least twenty percent of nine votes, so an alternative needs two votes to qualify. Votes for excluded alternatives do not enter the allocation denominator. Quotas

BEER Lab · Election 1 of 6

Intention totals

A	B	C
4	3	2

These responses are not final votes. Totals refer only to the nine people in your electorate.

[Continue](#)

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Figure 4.7: Aggregate intentions within the electorate; declarations remain nonbinding.

are recalculated from eligible votes. If no alternative were eligible, the announced fallback would allocate without the threshold. Equal remainder ties use a uniformly drawn priority rather than permanently favoring A.

At sincere 4–3–2, all qualify because two ninths are approximately 22.22 percent. The threshold therefore does not alter that benchmark. Use 5–3–1 to show its effect: C is excluded, and eligible quotas become $10(5/8) = 6.25$ and $10(3/8) = 3.75$, producing 6–4–0 seats. C-preferring voters still earn according to their schedules, receiving $0.6(20) + 0.4(0) = 12$ ECU. Exclusion from seats is not automatic exclusion from every positive payment.

With three alternatives and a twenty-percent threshold, it is impossible for all alternatives to fail: at least one receives a third of the votes or more. The fallback is a technical safeguard, not an expected outcome under these configurations. Do not invent a story of total representation failure to justify it. The substantive issue is excluding a one-vote alternative and how that changes seat allocation, payments, and incentives.

BEER Lab · Election 1 of 6

Election result

Your payment in this election

21.00 ECU

First-stage count

A	B	C
4	3	2

Votes

Seats

A	B	C
5	3	2

Payment uses your table and the outcome shown. Votes and counting points are not paid as ECU.

Continue

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

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Figure 4.8: Proportional outcome: seat allocation and weighted payment without an exclusive winner.

Instructor report and interpretation of figures

5.1 Controlled revelation and progress

Open the selected session's Report tab; this is the administrative Admin Report view. Its header shows participants and completed electorate-election units relative to the expected total. Aggregate figures stay hidden until all active elections in every electorate are complete. Reveal results then becomes available; Hide results removes them from the projector again. Reloading the report restores the hidden state. This control prevents fast groups from seeing classroom results while another group is still deciding.

oTree Demo Sessions Rooms Data Server Check Logout

[EN] Electoral Systems and Strategic Voting — One election: session 'uvntzbrf' (demo)

New Links Monitor Data Payments Report Description

App Name Round Number

electoral_rules_game (10 rounds) 10 Go

BEER Lab

Electoral systems: instructor report

Plurality

Participants 9	Completed elections 0 / 1	Pending elections 1
--------------------------	-------------------------------------	-------------------------------

Reveal results Hide results

Aggregates remain hidden until all elections finish.

Figure 5.1: Private report before completion: figures hidden and revelation disabled.

Do not confuse nine people with nine electorates. Eighteen people and ten elections produce twenty electorate-election units and 180 participant-election observations. Nine people in one election produce one electorate-election and nine individual observations. The report retains both denominators. Pending groups contribute no artificial zeros to means or histograms. They enter aggregates only when their election is complete, so the denominator represents usable observations rather than merely scheduled ones.

5.2 Winners, seats, and earnings distributions

The first figure counts winning alternatives for single-winner rules. Its denominator is completed electorate-election units. If A won six of ten, that means six collective outcomes, not six students or six votes. Under proportional representation this figure instead displays each alternative's mean seats out of ten. A mean of five does not mean that the alternative won half the elections, because the outcome is a shared allocation rather than exclusive victory.



Figure 5.2: Winning-alternative distribution and electorate-election denominator.

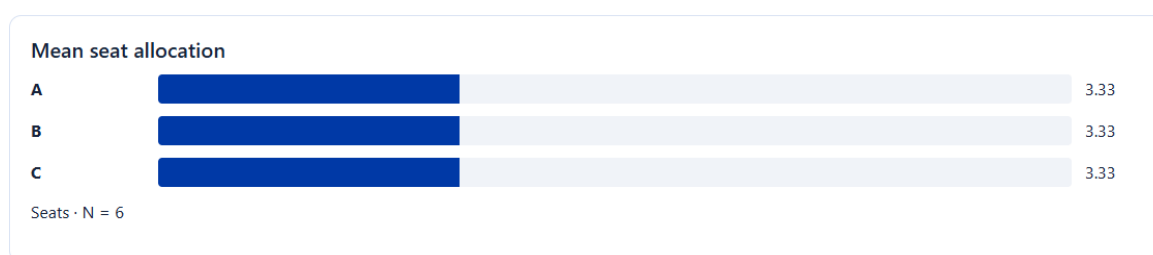


Figure 5.3: The proportional figure displays mean seats rather than exclusive victories.

The earnings histogram uses participant-election payments between zero and thirty ECU. Bins have width five and include their lower bound while excluding their upper bound, except the last bin includes thirty. Twenty belongs to the bin starting at twenty, and thirty belongs to the final bin. Single-winner outcomes generally produce zero, twenty, and thirty; proportional outcomes can produce intermediate values such as thirteen, sixteen, and twenty-one.

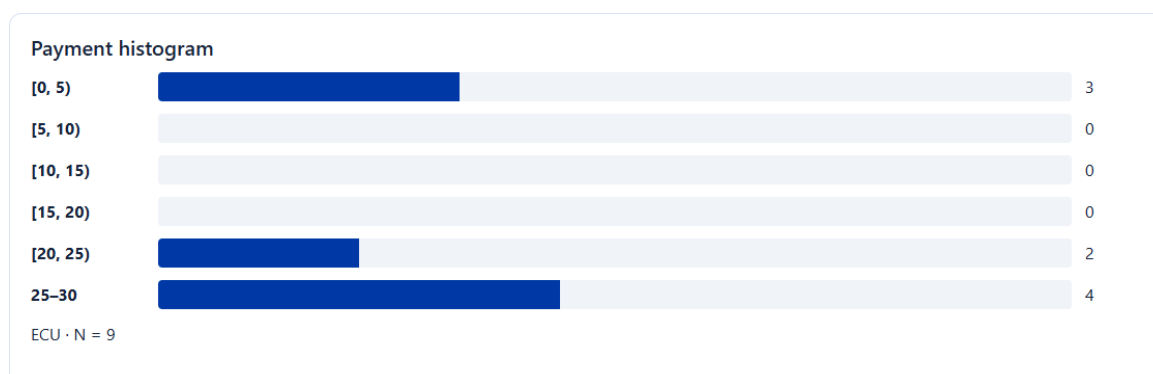


Figure 5.4: Earnings histogram with intervals, experimental currency, and observation count.

Similar averages can hide different distributions. Compare an exclusive outcome paying thirty to four people, zero to three, and twenty to two, with a proportional allocation paying twenty-one, thirteen, and sixteen to those types. The second can reduce extremes while having a lower total. Ask which criterion the class wishes to evaluate before selecting a figure. Total earnings, dispersion, and representation concern different questions and should not be treated as interchangeable summaries.

5.3 Favorite departures and concentration

For single-choice ballots, favorite departure counts a vote other than the alternative paying thirty ECU. For Borda it counts a first-ranked alternative other than that favorite. For approval it counts ballots that exclude the favorite. These measures share a broad descriptive question but differ behaviorally. Their percentages should not be compared as though they were one universal index of strategy. Keep the underlying ballot interpretation next to any cross-rule comparison.

Ballot differs from the first preference

0 / 9 = 0.00 %

This measure describes a choice. It cannot distinguish strategy, indifference, error or preferences different from the induced incentives.

Effective number of lists by votes: 2.79

Figure 5.5: Observable ballot measure and explanation of its interpretive limits.

Concentration appears only for one-vote ballots. The effective number is $N_{\text{eff}} = 1/\sum_j s_j^2$, where s_j is an alternative's vote share. For 4–3–2 it equals $81/(16 + 9 + 4) = 81/29 \approx 2.79$. For 6–3–0 it equals $81/45 = 1.8$. A value near two describes concentration; it does not establish a two-party system or identify the beliefs responsible. It also cannot distinguish parties withdrawing from voters reallocating support when candidates remain fixed.

The program calculates concentration within each electorate-election and then averages. Calculating it from all pooled votes can yield another result when electorates concentrate on different pairs. That is a difference in unit of analysis rather than rounding. The same index is not computed from pooled Borda points or approval counts, where a ballot contributes different kinds or numbers of marks. Preserving units prevents a superficially consistent chart from implying a misleading comparison.

5.4 Evolution, polling changes, and runoff frequency

The trajectory plots mean earnings by election on a constant zero-to-thirty ECU scale. The accompanying table gives completed groups, observations, mean payment, and favorite departure for each election. An unfinished election has no mean rather than an artificial zero point. Single-election configurations remain represented correctly even if the administrative view opens from the last technical period available. The report explicitly aggregates active elections rather than relying on the period shown in its URL.

For runoff, the report counts elections requiring a final ballot. For polling, it counts individuals whose actual vote differs from declared intention. Use the displayed denominator: poll changes concern participant-election observations, whereas runoff needs concern collective elections. More intention changes can coexist with stable winners. To study the direction of change, use intention and vote fields in the original export rather than assume every change moves toward the initial leader.

Reports do not combine separate sessions automatically. To compare institutions, preserve each report and export with configuration identifiers, then construct a transparent comparison table. Do not add plurality winners to proportional seats. Mean experimental earnings offer a common unit within this protocol, but retain rule-specific outcomes alongside them so that averaging does not erase the institutional mechanism. A fair comparison may need more than one figure.

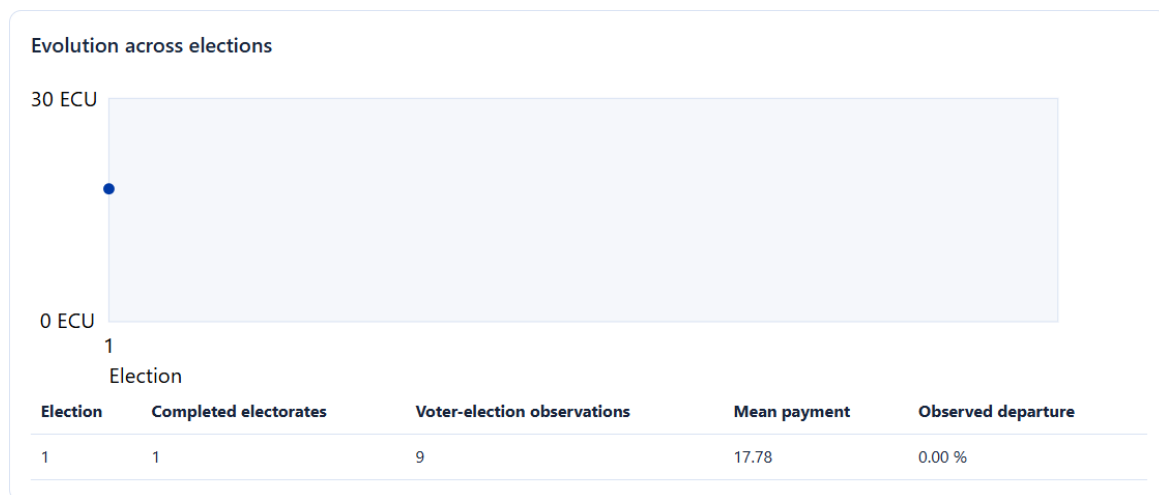


Figure 5.6: Election trajectory and denominator table with a fixed earnings scale.

Evidence and interpretation

6.1 What the original studies contribute

[Forsythe et al. \(1993\)](#) study how polls and electoral history affect coordination in experimental three-candidate elections. Outcome-contingent payments induce publicly known preferences. Their design motivates separating initial information, prior declarations, and experience rather than explaining every ballot change as a preference change. This teaching activity retains those questions, but uses a different cyclic profile and initially private composition in the basic treatment. Its numerical benchmarks must therefore be calculated from its own protocol.

[Forsythe et al. \(1996\)](#) compare plurality, approval, and Borda with and without nonbinding polls. Their evidence emphasizes that actions respond to both rules and expectations and that coordination can differ across groups. This teaching family supports discussion of those mechanisms without reproducing every factorial combination in the article. Here, polling is offered under plurality; approval and Borda have their own configurations. Do not describe a poll-by-Borda comparison as implemented when that combination is not provided.

[Laslier and Van der Straeten \(2008\)](#) provide an experimental reference for approval voting. Their article helps frame the difference between an ordinal preference and a set of acceptable alternatives. Our ballot uses induced payments in a small electorate, whereas other voting experiences may involve actual political alternatives. The conceptual connection is flexible expression. Published frequencies are not imported as classroom observations or promised as outcomes that the instructor will necessarily obtain.

[Smith \(2012\)](#) illustrate the teaching value of a classroom voting game for concentration associated with plurality. This activity keeps three alternatives fixed and does not implement party formation or entry. Concentration of ballots can occur, but it does not by itself demonstrate a two-party political system. Make this scope explicit when connecting the classroom activity to Duverger's law. A claim about party systems needs mechanisms beyond the counting of votes for exogenous alternatives.

[Bol et al. \(2018\)](#) separate strategic decisions by parties and voters in a laboratory experiment. That distinction matters here because this application implements voters' behavior only. Explaining actual electoral systems also requires candidate supply, entry, party coordination, and institutional context. This family does not replace those modules; it provides a controlled comparison on the voter side. Treat the study as a reason to recognize this boundary rather than claim a literal replication.

6.2 Scope of theoretical results

[Gibbard \(1973\)](#) and [Satterthwaite \(1975\)](#) clarify why manipulation is difficult to eliminate for single-winner rules with three or more alternatives under their conditions. Their results concern broad preference domains and specified properties. They do not imply every profile is manipulable or every participant will find a profitable deviation. Applying them to seat allocation or randomized tie-breaking requires care rather than treating every institutional comparison as a direct corollary.

Use the Borda and runoff examples as local demonstrations. Specify others' actions, the deviation, the new outcome, and the new payment. This is more informative than claiming that every voting rule fails. The particular sincere plurality profile can be a weak equilibrium, while the sincere Borda rankings admit the calculated deviation. General impossibility results and specific strategic examples play different roles in teaching. Keeping those roles separate protects both theoretical accuracy and empirical interpretation.

[Palfrey \(2009\)](#) offers an overview of laboratory political economy connecting institutions, incentives, and behavior. A laboratory can hold some features constant while changing others, but this advantage does not eliminate learning, information, or selection issues. A teaching session provides evidence about a defined environment rather than a representative survey of national voters. Its initial value is making consequences of mechanisms observable where real elections combine many influences at once.

Attention

Do not describe the 4–3–2 profile as an exact article replication or attribute published findings to the current class. Numerical predictions in this guide are protocol calculations. Articles motivate questions and mechanisms. Turning a classroom activity into research requires an appropriate identification design, recruitment, consent, and data-management process. Teaching preparation does not substitute for those separate decisions.

6.3 Moving from an observed pattern to an explanation

Suppose ballots concentrate on A and B after several elections. One possible explanation is that C-preferring voters anticipate a low chance of winning and support A to avoid B. Another is exploration after unfavorable outcomes. Information learned about composition may also matter. A concentration chart describes the pattern but does not choose among these mechanisms. Ask students for reasons after decisions are closed, as discussion, rather than report those reasons as variables the program already collected.

Now suppose a poll announces $A=4$, $B=3$, $C=2$, while actual votes are $B=6$, $A=2$, $C=1$. The collective change establishes that declarations and actions differed. Identifying who changed and in which direction requires individual fields. Identifying why requires additional information. Do not infer that everybody followed the initially leading alternative: another won. Coordination may reflect compatible second preferences, a response to the poll, or expectations not measured by the activity.

If Borda selects A with ten points against B's nine, inspect rankings before saying students learned strategic voting. The worked manipulation can produce those totals, but so can other combinations. Aggregate outcomes do not uniquely identify individual ballots. Counterexamples help students formulate testable explanations and avoid turning a visually convincing chart into a mechanism the recorded data cannot establish. The same caution applies to interpreting a stable winner as unchanged actions.

Teaching sequence and exercises with answers

7.1 Debriefing for an instructor new to the topic

Begin by asking which rule was used and what object was counted. Before discussing equilibrium or manipulation, reconstruct one electorate's outcome using the payment table. Then reveal winner frequencies and the earnings histogram. Ask why two people who sent the same ballot might receive different payments. Their private schedules can differ; a vote does not purchase a uniform return. This operational question creates a clear bridge from participant experience to the economic mechanism.

Reveal the full composition only after everybody finishes unless the treatment already made it public. Write the three preference orders and reconstruct the majority cycle. This transforms an individual experience into a social-choice problem. Compare plurality with another rule on the same profile as a board exercise, carefully labeling the calculation as a counterfactual. Do not present it as a second outcome actually produced by those students unless they played that treatment.

Feedback script

“First describe what happened: how many electorates completed, which alternatives were selected, and how earnings were distributed. Then compare actual ballots with selecting a favorite. Finally ask whether a particular change could improve payment given the others' actions. A strategic explanation needs that final calculation; observing a different ballot alone is insufficient.”

For an introductory class, conclude with plurality versus absolute majority. For game theory, add best responses and multiple equilibria. For social choice, develop the majority cycle and Borda. For political economy, connect polls, coordination, and representation. One application can support different levels without changing participant instructions or putting theoretical explanations on the welcome screen. Theory belongs in preparation and feedback, where it does not preselect students' actions.

Before projecting graphs, ask students to write one prediction privately. Then reveal the report and ask them to compare it with their prediction. This is an instructional prompt rather than a built-in elicitation of beliefs. If the teacher later analyzes those written responses, preserve their distinct source and timing. Do not merge them with automatically exported ballots without documenting how they were collected and whether students knew they would be analyzed.

7.2 Exercise: separating institutional criteria

Offer four statements: A received more votes than each rival; A received more than half; A would beat every rival in pairwise voting; A maximizes total induced earnings. Ask students to evaluate them under the sincere profile. The first is true, the second false, the third false because C beats A, and the fourth false because B produces 170 ECU against A's 160. The exercise separates four criteria often collapsed into the word winner.

If someone says A is legitimate because it won, ask which criterion they mean rather than require them to abandon a normative judgment. Winning under an announced rule can support a procedural argument; maximizing total earnings supports a consequential argument; representing minorities supports another. The purpose is to make criteria explicit and show they are not equivalent. The application computes outcomes but does not select a complete theory of democratic legitimacy.

As an extension of the discussion, ask whether two criteria could be satisfied simultaneously in another preference profile. The current profile is chosen to expose tensions, not to claim every election produces a cycle. Students can propose a hypothetical profile in which everyone prefers A and check that plurality, pairwise majority, and Borda all choose A. Keep this paper exercise separate from implemented configurations, whose induced composition remains fixed.

7.3 Exercise: ties and expected value

Use the sincere Borda scores $A=10$, $B=10$, $C=7$. Uniform selection between A and B gives expected payments of 25 for an A type, 15 for a B type, and 10 for a C type. If the realized draw selects A, observed payments are instead 30, 0, and 20. Ask why expectation and realization differ. The first weights possible outcomes before the draw; the second records one realized alternative. Randomness does not make the payment calculation arbitrary.

Next ask an A type to evaluate A–C–B. Scores become 10–9–8 and the tie disappears, delivering 30 with certainty if other rankings remain sincere. Ask what information the person would need to rely on that calculation during play. They must know or anticipate other actions and understand tie-breaking. Private composition does not initially provide those facts. Repetition can reveal partial information without revealing every ballot or guaranteeing that behavior remains fixed.

Students can also calculate collective expected earnings under the original tie: $(160 + 170)/2 = 165$ ECU. The manipulation produces A and total earnings of 160, although it increases one person's expected payment from 25 to 30. This distinguishes individual incentives from aggregate earnings. A profitable unilateral change need not maximize collective welfare. Label both values as calculations under specified actions, not as actual class data or a general characterization of every Borda election.

7.4 Exercise: approval and denominators

Calculate the result if everyone approves positive-payment alternatives: $A=6$, $B=7$, $C=5$. There are eighteen approvals but only nine voters. Dividing A's six by eighteen measures its share of all approvals. Dividing by nine measures the share of people approving A. These are different quantities. The rule compares counts; it does not require a majority of all approvals. State which denominator supports each sentence before discussing whether an alternative has broad support.

Now suppose everybody approves all three: each receives nine and uniform tie-breaking applies. Suppose nobody approves any: each receives zero and the same tie distribution applies. Even though the winner distributions match, submitted actions are radically different. This example

shows why the export preserves individual approval fields and why equal collective outcomes do not establish equal processes. A histogram of winners alone cannot distinguish expressive saturation from universal empty approval.

Ask whether a voter who approves A and B has abandoned A. The answer depends on the measure: if A is their favorite, the favorite is still included. Approval expresses a set rather than a ranking, so selecting B as well does not state B is preferred to A. This is why the report's approval measure is favorite exclusion, and why it cannot be substituted for first-choice deviation in a Borda or plurality analysis.

7.5 Exercise: quotas, remainders, and threshold

For votes 3–3–3 and ten seats, every quota is $10/3$. Integer parts assign nine seats and leave one. Equal remainders require a uniformly random priority to decide the tenth seat. Allocation is 4–3–3 in some order. It cannot assign exactly a third of ten integer seats to each alternative. The difference reflects indivisibility, not necessarily permanent institutional favoritism toward A. Repeating the exercise distinguishes fairness in probabilities from equality in each realized allocation.

For votes 5–3–1, compare no threshold with the twenty-percent threshold. Without a threshold, quotas are $50/9$, $30/9$, and $10/9$. Integer parts sum to nine and A has the largest remainder, yielding 6–3–1. With the threshold, allocation is 6–4–0. An A type's payment changes from $0.6(30) + 0.3(20) = 24$ to 26 ECU; a B type's from 11 to 12; a C type's from 15 to 12. The reform creates both beneficiaries and losers.

The induced electorate contains four A types, three B types, and two C types regardless of the 5–3–1 submitted votes. Total earnings without the threshold are $4(24) + 3(11) + 2(15) = 159$; with the threshold they are $4(26) + 3(12) + 2(12) = 164$. Thus the aggregate increases while C types lose. This calculation illustrates why a higher total and protection of a particular minority are distinct evaluation criteria. Votes cannot be used as substitute frequencies for preference types.

7.6 Exercise: learning and identification

Provide two hypothetical earnings trajectories, one rising and one stable, and ask for three possible explanations of each. Rising earnings may reflect coordination, changing votes, or realized ties. Stability can coexist with different winners whose earnings effects offset. Clearly label these as hypothetical exercises rather than pilot results. The application report contains actual session decisions only; illustrative trajectories belong in the instructor's explanatory material.

For a short assignment, ask every student to write a descriptive statement, a conditional prediction, and a question current data cannot resolve. A descriptive statement cites a denominator; a prediction specifies other actions; an open question identifies missing information. Grade clarity rather than rewarding a particular ballot. Participation is not an examination in choosing a strategy taught beforehand. The activity is valuable precisely because different actions and explanations can be examined after outcomes are known.

Data and implementation

8.1 Exporting and preserving active elections

Open Data within the appropriate session and download its CSV or Excel-friendly CSV. The general oTree export typically uses a participant row with columns for several rounds. This family's custom export uses a participant-election row. To obtain it, open Data in the top navigation, find Custom exports, and select CSV beside electoral_rules_game (custom_export). That file includes sessions from this instance: filter the session column to the selected session code before analysis. A complete eighteen-person, ten-election session then has 180 filtered data rows plus the header. Do not assume ten rows per person in every file without first checking its organization and field names. Downloading from the session's own Data tab is already restricted to that session and retains its rounds in columns. The global custom download needs the session-code filter to separate rehearsals and classes.

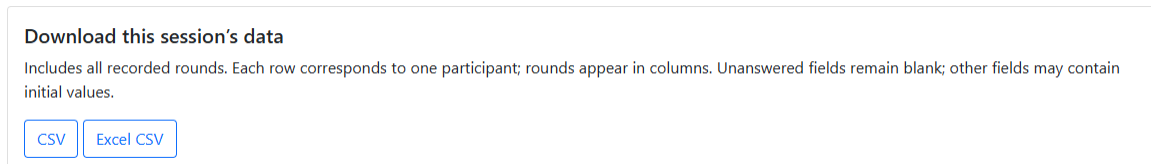


Figure 8.1: Protected session Data download: CSV and Excel CSV preserve all recorded elections.

The custom file retains session, participant, election, electorate, treatment, grouping mode, preference type, and A/B/C payment schedules. It adds intention, vote, approval fields, ranking positions, or final vote where applicable. Group fields retain counts, finalists, quotas, seats, eligibility, tie priorities, and completion. Earnings are blank for pending electorate-elections rather than zero by default. A recorded zero in a completed election can be a genuine outcome and must remain distinguishable from missingness.

Fields irrelevant to a rule remain empty. Do not turn an absent ranking into alternative C or a missing approval into rejection. The winner field is empty under proportional representation because the mechanism allocates seats. Ten technical rounds do not imply ten active decisions in every configuration. The custom export excludes inactive periods and preserves pending records within the selected horizon. This matters particularly when comparing a single election with repeated configurations in the same application.

Checkpoint

After downloading, verify session code, treatment, active horizon, and row count. Recalculate one completed observation's earnings from its schedule and outcome. Inspect one pending observation and confirm that earnings are blank. Preserve the original file before transforming

variables, and record access problems or departures. A transformation should not silently change what counts as a valid ballot or a completed electorate.

8.2 Comparisons and the experimental unit

Collective outcomes belong to the electorate-election unit. Winner counts and seat allocations concern that unit. Ballot changes belong to participant-election observations, retaining group and session identifiers. Nine members share one collective outcome, so their payments are not independent outcomes of the institution. Repetition also records each person more than once. More rows do not automatically mean more independent observations, and the choice of denominator cannot substitute for a sampling design.

A useful comparison table records rule, session count, electorate count, active elections, mean earnings, winner distribution or seats, and a ballot measure appropriate to the rule. Keep treatment order, information, and matching separate. Do not combine public composition and polling under an undifferentiated information label. One reveals induced preferences; the other collects declarations about actions. Their information content and potential credibility problems are different, even though both add an earlier screen.

If fixed groups concentrate votes more than rematched groups, consider shared history and the recomposition of individuals within preference types. The 4–3–2 composition remains fixed, but people can learn differently. Descriptive classroom tables can explain these patterns transparently. Formal statistical inference requires a design and uncertainty measures recognizing dependence across groups and participants. Avoid tests that treat each repeated row as a newly recruited independent person.

8.3 Ties, recorded randomization, and reproducibility

The program draws independent uniform permutations of A, B, and C to resolve first-stage and final-stage ties. Among tied alternatives, every possible winner has equal probability. For proportional remainder ties, the recorded priority determines which tied remainder receives a remaining seat. The original priority is retained in the export, making the realized allocation reproducible conditional on that draw. The software does not continually redraw until an instructor-preferred outcome appears.

Recomputing an outcome from exported ballots must use the stored priority rather than draw a fresh one. A new draw could select another tied winner while all ballots remain unchanged, falsely suggesting an error. Randomized outcomes should be described as one realization of an announced procedure. If several groups reach identical counts and different winners, inspect tie status before interpreting the difference as a failure of common rules or a preference difference.

8.4 Waiting, links, and missing participants

A long wait calls for checking whether every member submitted the required ballot and whether someone remains at comprehension. Ask students with errors to read their explanations; do not complete their votes from the teacher's computer. Check connection and the assigned link. Reopening the same participant link can resume the sequence while the session remains intact. Distributing another participant's link can instead create or enter a different participation.

A participant route from a deleted session may produce Not Found or a message that the user no longer exists. That does not necessarily mean the stable room URL is wrong. Open the appropriate room for a current session rather than reuse temporary rehearsal links. Do not reset the laboratory database to solve one link problem. Preserve registered decisions and involve the responsible technician when recovery requires changes beyond ordinary instructor operation.

If someone is absent before starting, select a valid number of complete electorates and create the correct session. If someone leaves afterward, document the incident: their electorate may remain pending. The application does not invent the missing vote or silently reduce group size from nine to eight. A classroom may discuss the incomplete group separately or use another prepared session, but exclusions must be explicit. Administrative handling of absence is not an electoral treatment.

8.5 Deployment, privacy, and teaching materials

The family requires an isolated instance with its own database. Its proposed hostname should point to that instance with administrative authentication and production protection. Local preparation checks logic and presentation; DNS, certificates, and a persistent service are deployment tasks for the laboratory. This guide's canonical URLs are product routes, not a claim that a newly prepared card is already available on the public website. Check deployment before scheduling a student session.

Project only anonymous aggregates. Participant codes link observations across elections in working files; they are not classroom labels for identifying students. Do not project individual start links or full exports. Keep the original download, an analysis copy, and debrief figures separate. If an analysis error is corrected, preserve the prior version and document the correction so that the comparison can be reconstructed from original records rather than rely on the latest spreadsheet alone.

8.6 Reading plan and preparation of the debrief

Choose initial reading according to the teaching objective. Start with the two Forsythe papers for coordination and information. Consult Smith for a short classroom activity on electoral concentration, comparing its scope with fixed alternatives. Use Laslier and Van der Straeten for approval voting. Read Bol, Blais, and Labbé St-Vincent to separate strategic supply and demand. Gibbard and Satterthwaite support manipulability foundations, provided their conditions remain explicit.

Before class, prepare a sheet with payment schedules, three pairwise counts, and one worked example of the selected rule. After class, add the actual observed outcome and a remaining question. This connects theory, protocol, and evidence without conflating them. The instructor does not need to lecture on every article before students play. The bibliography supports informed debriefing and allows depth to vary with the course's level.

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