



# Instructor guide to hospital-resident matching

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/>

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# How to use this guide

This guide supports the preparation, implementation, and classroom discussion of the hospital-resident matching family developed by the Behavioral and Experimental Economics Research Lab (BEER Lab) in the Department of Economics at Tecnológico de Monterrey. It is written for instructors in game theory, microeconomics, market design, labor economics, economics of education, and experimental economics.

It does not assume prior specialization in matching theory. The document offers three reading paths. The quick guide is enough to organize a first class.

The operational chapters explain access, participant screens, the private instructor report, and troubleshooting. The conceptual chapters develop stability, deferred acceptance, incentives, experimental evidence, and limits of interpretation. Basic and extended variants belong to one family: common features are explained once, while each treatment section states only what changes.

## Author

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### For the instructor

For a first use, choose the one-round basic version to introduce the algorithm, or ten rounds with a fixed market to study learning. Before revealing results, collect a prediction about stability, truthful lists, and first-choice assignments. Project only the aggregate report. Never display participant codes or connect choices to names, student numbers, or physical seats in the laboratory.

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# Quick guide and learning outcomes

## 1.1 Access through the updated laboratory website

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

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



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



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

## Checking resources, comprehension, and participant requirements

Before opening the room, check the selected configuration and the number of students present. The session-creation form states the group size and minimum required by that configuration. An individual activity accepts any positive participant count; an interactive activity must satisfy its stated requirement: complete groups when size is fixed, or a minimum participant count when size is flexible. Requirements may change across treatments, for example when adding a third party or changing an institution's size. If you edit a grouping parameter, check the requirement for the edited configuration, rather than relying only on the demo's suggested count.

In the instructions, ensure that students can identify what each role receives, what they can decide, and how the outcome is calculated. An initial account, a distributable budget, and final earnings need not be the same amount. Refer to the resources panel and the example for the selected treatment. Do not carry the basic edition's endowment into a treatment that changes accounts or introduces additional positions.

ECU stands for *Experimental Currency Units*: the activity's unit of account. An outcome of 100 ECU does not automatically equal 100 pesos or 100 dollars. Conversion depends on the session configuration. Before announcing a payment, confirm with the laboratory whether money is paid, the conversion rate, and which decisions count for payment. In hypothetical modules, describe amounts as outcomes in the stated situation.

When a comprehension check is included, an incorrect response receives an explanation beside that question, identifying the submitted answer and the correct answer. Other answers remain in the form. Ask the student to return to the example, locate the relevant rule, and redo the calculation before correcting the response. Avoid revealing answers to the entire class for an individual error, and do not interpret a comprehension mistake as an economic choice in the game.

|                                                                         |
|-------------------------------------------------------------------------|
| hospitales y residentes — una ronda                                     |
| hospitales y residentes — 10 rondas, mercado fijo                       |
| hospitales y residentes — 10 rondas, mercados reasignados               |
| Resident Matching — one round                                           |
| Resident Matching — 10 rounds, fixed market                             |
| Resident Matching — 10 rounds, reassigned markets                       |
| Resident Matching — DA baseline, one round                              |
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| Resident Matching — immediate acceptance                                |
| Resident Matching — program-proposing DA                                |
| Resident Matching — serial dictatorship                                 |
| Resident Matching — lists limited to two programs                       |
| Resident Matching — unequal capacities                                  |
| Resident Matching — aligned preferences and congestion                  |
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| Hospital-Resident Matching — DA baseline, 10 rounds, reassigned markets |
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| Hospital-Resident Matching — program-proposing DA                       |
| Hospital-Resident Matching — serial dictatorship                        |
| Hospital-Resident Matching — lists limited to two programs              |
| Hospital-Resident Matching — unequal capacities                         |
| Hospital-Resident Matching — aligned preferences and congestion         |

### Matching de hospitales y residentes / Hospital-Resident Matching — BEER Lab

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

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

## Rooms

### Current rooms:

|                                                     |
|-----------------------------------------------------|
| [ES] Matching de hospitales y residentes            |
| [EN] Hospital-Resident Matching                     |
| [ES] Matching de hospitales y residentes: extendido |
| [EN] Hospital-Resident Matching: extended           |

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

## Room: [EN] Hospital-Resident Matching

### Create a new session

Session Config

[EN] Hospital-Resident Matching — one round

Number of participants

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

Create

[Configure session](#) 

### App sequence

**hospital\_residents\_game**  
(10 rounds)

Four applicants rank residency programs. A centralized mechanism uses their submitted lists, program priorities, and capacities to produce a match. Basic sessions use applicant-proposing deferred acceptance; extended sessions compare alternative mechanisms and market environments.

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

## Downloading a session with several rounds

### For the instructor

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

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

### Attention

The public hostname is the proposed deployment route for this family. The validated local instance uses port 8037. Demo must contain exactly 24 configurations, and Rooms must contain exactly four rooms. If another game appears, do not launch a session; check `GAME_FAMILY=hospitalmatching`.

|                          |                                                                                                                                                 |
|--------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Purpose</b>           | Compare mechanisms that assign people to institutions when both sides have preferences or priorities and a price cannot clear the market.       |
| <b>Experimental unit</b> | A market of four applicants. Programs are automated institutional agents.                                                                       |
| <b>Basic edition</b>     | Applicant-proposing deferred acceptance; one round, ten fixed-market rounds, or ten reassigned markets.                                         |
| <b>Extended edition</b>  | Immediate acceptance, program-proposing DA, serial dictatorship, truncated lists, unequal capacities, and aligned preferences.                  |
| <b>Decision</b>          | An ordered list of four programs, or two programs when lists are constrained.                                                                   |
| <b>Payoff</b>            | Private value of the assigned program: 100, 75, 50, or 25 ECU; 0 ECU if unmatched.                                                              |
| <b>Students</b>          | <a href="https://hospitalmatching.beer-lab.org/room/hospital_residents_en">https://hospitalmatching.beer-lab.org/room/hospital_residents_en</a> |
| <b>Instructor</b>        | <a href="https://hospitalmatching.beer-lab.org/demo">https://hospitalmatching.beer-lab.org/demo</a>                                             |
| <b>Local test</b>        | <a href="http://localhost:8037/demo">http://localhost:8037/demo</a> , with <code>GAME_FAMILY=hospitalmatching</code> .                          |
| <b>Topics</b>            | mechanism design; matching; deferred acceptance; markets without prices; experimental economics.                                                |
| <b>JEL</b>               | C78; C92; D47.                                                                                                                                  |

By the end, students should distinguish applicant preferences from program priorities; execute deferred acceptance by hand; explain why a tentative hold is not a final assignment; identify a blocking pair; separate stability, efficiency, and equity; compare proposing and receiving sides;

explain why immediate acceptance may induce strategic rankings; and recognize how quotas and list-length constraints alter outcomes.

The exercise also develops empirical discipline. An assignment combines values, lists, priorities, capacities, and the mechanism. Few first choices may reflect scarcity, while a list that departs from the induced order may reflect confusion. The report lets discussion begin with measured facts and then consider compatible mechanisms.

# Economic structure of the activity

Each market contains four applicants and four programs. Every applicant receives a true preference order represented by private values of 100, 75, 50, and 25 ECU. If the Gold Program is worth 100 ECU and the Blue Program 75 ECU to one applicant, assignment to Gold pays 100 ECU while assignment to Blue pays 75. Values are private, so another applicant may have the reverse order. The submitted list may or may not match the induced order.

Every program has a capacity and a priority order over applicants. Priority is neither a monetary valuation nor a choice made by a person during the session. It is a programmed institutional rule. It can represent an admission score, seniority, an eligibility rule, or the outcome of an earlier process. When multiple applicants request a position, priority determines whom the program holds.

In the baseline, each program has one position. Applicant-proposing deferred acceptance starts with every person proposing to the first program on the submitted list. A program with one position tentatively holds its highest-priority applicant and rejects the rest. Each rejected applicant proposes to the next option. The procedure continues until no new proposal remains. Surviving holds become final assignments.

Formally, let  $R$  denote applicants and  $H$  programs. Applicant  $i \in R$  submits list  $P_i$ , program  $h \in H$  has priority  $\succ_h$  and capacity  $q_h$ , and matching  $\mu$  associates each applicant with a program or an outside option while assigning no more than  $q_h$  people to program  $h$ . The teaching payoff is

$$\pi_i = \begin{cases} v_i(\mu(i)), & \text{if assigned to a program,} \\ 0, & \text{if unmatched.} \end{cases}$$

Across repeated sessions, ECU are added over rounds. There is no implicit monetary conversion. The instructor must announce whether ECU are classroom points or determine another incentive before decisions begin.

A pair  $(i, h)$  blocks a matching under true preferences when applicant  $i$  prefers  $h$  to the current assignment and program  $h$  has a vacancy or gives  $i$  higher priority than at least one current assignee. A stable matching has no blocking pair. This definition incorporates capacity. A vacant program can block with an applicant who prefers it to the outcome. A full program blocks only if its priority would replace an occupant.

Stability does not mean that everyone receives a first choice. It does not mean maximizing total ECU, treating every applicant symmetrically, or selecting the same outcome regardless of which side proposes. Its institutional appeal is different: a blocking pair has a mutual reason to depart from the centralized result. Stability rules out that bilateral deviation, given the preferences and priorities used in the analysis.

**Theoretical foundation**

The activity separates five objects that are often conflated: a true preference, a submitted list, an institutional priority, capacity, and the resulting assignment. Before discussing incentives, ask the class to locate each object on an actual screen. This prevents students from reading high priority as an applicant preference or treating a submitted list as a perfect welfare measure.

# Matching theory and predictions

## 3.1 Deferred acceptance and termination

Gale and Shapley (1962) showed that deferred acceptance produces a stable matching in a two-sided market with strict preferences and appropriately defined capacities. The algorithm terminates because each applicant proposes to each program at most once. A rejection is final: a program that rejects an applicant already holds higher-priority applicants, and later it can only replace them with even higher-priority applicants. An infinite proposal sequence is therefore impossible.

To execute the algorithm on a board, put applicant lists on the left and program priorities on the right. At every step, circle new proposals, mark tentative holds, and cross out rejections. Preserve the history. The pedagogical point is to see that a tentatively held applicant may be displaced while a rejected applicant never needs to apply to the same program again.

The intuitive stability argument uses that proposal history. Suppose applicant  $i$  prefers program  $h$  to the final assignment. If the applicant submitted that ordering,  $i$  must have proposed to  $h$  before reaching the eventual outcome. The program rejected  $i$  because it could fill capacity with higher-priority applicants, and its final assignees are at least as highly prioritized. Program  $h$  cannot prefer  $i$  to its final occupants. Mutual improvement, and hence a blocking pair under submitted lists, is impossible.

## 3.2 Side optimality

More than one stable matching may exist. Applicant-proposing DA selects the applicant-optimal stable matching: each applicant obtains the best outcome available in any stable matching. When programs propose, the result is program optimal and generally less favorable to applicants within the stable set. This statement does not mean that every program receives its first choice or that every receiving-side agent loses in every realization. It orders stable matchings.

The program-proposing variant shows that stability need not identify a unique outcome. If both algorithms produce the same assignment, the induced stable set may be small or unique. If they differ, the identity of the proposing side has distributional consequences. A valid classroom comparison holds preferences, priorities, and capacities constant.

## 3.3 Incentives and revelation

Under applicant-proposing DA, truthful ordering is a dominant strategy for an applicant in the standard model: no false list improves the applicant's assignment for every profile of others'

behavior. This protection belongs to the proposing side. It does not say that programs can manipulate without consequences or that extensions with couples, complementarities, or message constraints preserve the same property.

The platform measures a truthful list by comparing the submission with the order induced by private values. With complete lists, all four programs must match the induced order. With two-option lists, the submitted pair is compared with the first two true options. Interpret deviations carefully. A false list may arise from a strategic belief, misunderstanding, fatigue, experimentation, or a mistaken reading of priorities. Comprehension checks reduce but do not eliminate these possibilities.

### 3.4 Immediate acceptance

Under immediate acceptance, positions allocated at each step become final. An applicant who first requests a highly competitive program may lose a safe alternative that fills in the first step. Applicants may need to consider priorities and expected demand. A ranking becomes both a statement about desirability and a strategy.

This treatment explains why “put my favorite first” is not equally safe under every mechanism. Hold values, priorities, and capacities constant and ask students to construct a case where an ambitious first choice harms an applicant under immediate acceptance but not under deferred acceptance.

### 3.5 Efficiency, stability, and equity

Pareto efficiency for applicants asks whether another assignment can improve someone without harming another applicant. Stability also incorporates program priorities. A stable assignment need not maximize total ECU, and an applicant-efficient assignment may violate priorities. Serial dictatorship provides simple incentives and efficiency relative to its order of choice, yet it can be unstable under heterogeneous program priorities.

Equity requires an additional criterion. It may mean respecting priorities, treating equals equally, reducing rank inequality, or protecting defined groups. The activity does not encode a universal definition of fairness. The report supplies first choices, true ranks, unmatched applicants, and assignments by program. The normative interpretation must follow the institution’s stated objective.

# Literature and institutions

Gale and Shapley (1962) formulated college admissions and stable marriage and introduced deferred acceptance. Roth (1982) connected stability and incentives and established important limits to strategic compatibility when both sides act. Roth (1984) studied the evolution of the United States market for interns and residents, showing how decentralized rules and early offers can create coordination problems over time.

The National Resident Matching Program provides motivation, but this BEER Lab activity is not a replica of the contemporary medical market. The real institution contains many more participants, longer lists, special rules, and issues such as couples. Tell students that the activity isolates the central mechanism. Treating it as a complete simulation would support overly broad conclusions about a complex institution.

Abdulkadiroğlu and Sönmez (2003) applied the analysis to school choice and explained how immediate-acceptance mechanisms can induce strategic behavior that distorts observed preferences. The distinction between priority and preference is central. A school may prioritize applicants according to a public rule without having a psychological preference. Chen and Sönmez (2006) compared school-choice mechanisms experimentally and showed that behavior, efficiency, and strategic performance differ across institutions.

Calsamiglia, Haeringer, and Klijn (2010) studied constrained lists. Limiting applications reduces administrative burdens but can change incentives and leave applicants unmatched even when acceptable vacancies exist. The two-option treatment makes that cost visible. Kagel and Roth (2000) experimentally studied clearinghouses and market unraveling. Their work helps explain why centralized matching can improve coordination and why stable rules may be more sustainable.

Experimental evidence does not imply one result for every class. Outcomes depend on market size, information, complexity, experience, incentives, and how priorities are displayed. Use the literature to form hypotheses. A classroom session provides local descriptive evidence. Causal claims require assigned treatments, independent markets, and a sufficient number of experimental units.

## For the instructor

A strong debrief separates three levels: the mathematical property of a mechanism under stated assumptions; behavior observed in the laboratory; and the desirability of a real institution with additional goals and constraints. DA stability does not eliminate distributional questions. A few nontruthful lists do not, by themselves, refute the theoretical incentive property.

# Platform access and architecture

The institutional path starts at <https://beer-lab.org/>. Open the teaching-games section at <https://teaching.beer-lab.org/> and select hospital-resident matching. The proposed family route is <https://hospitalmatching.beer-lab.org/>. Instructors use <https://hospitalmatching.beer-lab.org/demo>; students receive a stable room route.

The local version is <http://localhost:8037/demo>. The server must run with `GAME_FAMILY=hospitalmatching`. This variable filters configurations and rooms before oTree builds Demo and Rooms. One bilingual codebase serves the family while preserving four visible entries: basic Spanish, basic English, extended Spanish, and extended English.

| Room                                             | Use                           |
|--------------------------------------------------|-------------------------------|
| <code>emparejamiento_hospitales_es</code>        | Basic activities in Spanish.  |
| <code>hospital_residents_en</code>               | Basic activities in English.  |
| <code>emparejamiento_hospitales_extendido</code> | Extended variants in Spanish. |
| <code>hospital_residents_extended</code>         | Extended variants in English. |

Demo must contain 24 configurations: three basic configurations per language and nine extended configurations per language. Rooms must contain four rooms. Family isolation prevents a participant entering through the matching hostname from starting dictator, trust, auction, or another game. In production, the laboratory should use a separate instance and database for this family. Code filtering governs the visible catalog, while deployment isolation protects Sessions and Data.

# Preparation before class

Begin with the teaching question. To understand the algorithm, use the one-round baseline and solve the market on the board afterward. To study learning, use ten rounds with fixed markets. To reduce continuity among rivals while preserving repetition, use reassigned markets. To compare mechanisms, assign independent markets to different configurations before anyone sees results.

Participant count must be a multiple of four. Twenty-eight students form seven markets; thirty leave two students outside a complete market. Do not improvise human bots or reuse links. If attendance is uncertain, prepare an institutional plan: reduce active computers, assign nondecision observers, or change activities before the session is created.

Check language and edition in the visible name. Ten rounds may take 20 to 35 minutes, depending on familiarity. Reserve at least 20 minutes for debriefing. Test the network, projector, instructor access, and four participant links. Open the instructor report on a private tab and confirm that it remains hidden while decisions are pending.

Explain the incentive rule before beginning. If ECU are teaching points only, say so. If one round will be selected for a prize, announce selection and conversion before choices. Never change payment after observing decisions. Credibility is part of the experimental experience.

Place three questions on the board: What makes a matching stable? When is truthful ordering safe? Why are first-choice rates insufficient for evaluating a mechanism? Collect preliminary answers and preserve them. The final report lets the class return to those claims without turning feedback into an improvised lecture.

## Checkpoint

- Confirm `GAME_FAMILY=hospitalmatching`, correct port or hostname, and correct database.
- Verify 24 configurations in Demo and four rooms in Rooms.
- Choose language, edition, treatment, number of rounds, and regrouping rule.
- Confirm that participant count is a multiple of four.
- State incentives, time limit, network contingency, and closing message.
- Test cover, comprehension, ranking, wait, result, summary, and report.
- Keep the report private until everyone finishes.

---

# Step-by-step classroom implementation

Select the desired configuration in Demo. oTree creates a start-links page. Distribute each individual link once, or direct students to a stable room and use labels that do not reveal identity in discussion. Do not project participant links; their codes grant access to particular decisions. Use Monitor for progress and Report for aggregate feedback.

The cover displays the laboratory logo, purpose, and general rules. Establish silence before anyone presses Start. Instructions separate private values, capacities, and priorities, describe the mechanism, and show four programs with consistent visual identities. Allow time to read. Summarizing too soon may produce mechanical answers without understanding.

The comprehension page requires three ideas: the treatment-specific rule, the definition of a blocking pair, and payoff based on assignment. An incorrect answer returns treatment-specific feedback and keeps the person on the page. Do not tell an individual which option to select. You may explain the mechanism again to the class without revealing anyone's answer.

The ranking page shows programs, private values, capacities, and priorities. Each rank must contain a distinct program. The truncated-list treatment shows two positions; omitted programs are unacceptable to the mechanism. After submitting, an applicant waits for the rest of the market. A long wait means that at least one market member still has a pending decision.

The result page displays assigned program, true rank, ECU, anonymous market assignments, and stability under true preferences. It does not identify classmates. In repeated sessions, the button starts the next round. The final round leads to an explicit completion page with personal history. Participants should remain there until the instructor finishes the debrief.

oTree

[Demo](#)

[Sessions](#)

[Rooms](#)

[Data](#)

[Server Check](#)

[EN] Hospital-Resident Matching — one round: session 'hq52005a' (demo)

New

Links

Monitor

Data

Payments

Report

Description

Below are temporary links for testing and demonstration. To launch a real study, either create persistent links by setting up a [room](#), or create a session through the [sessions page](#).

Choose one of the following options to play the session:

Combined views

Split-screen view

Launch

Grid view

Launch

Session-wide testing link

Open the below link in up to 4 browser tabs.

<http://127.0.0.1:8037/join/jumonare>

Single-use links

Open each link in its own browser tab.

|    |                                                                                                                         |
|----|-------------------------------------------------------------------------------------------------------------------------|
| P1 | <a href="http://127.0.0.1:8037/InitializeParticipant/9yt9b129">http://127.0.0.1:8037/InitializeParticipant/9yt9b129</a> |
| P2 | <a href="http://127.0.0.1:8037/InitializeParticipant/gjys8zz8">http://127.0.0.1:8037/InitializeParticipant/gjys8zz8</a> |
| P3 | <a href="http://127.0.0.1:8037/InitializeParticipant/j0frta6">http://127.0.0.1:8037/InitializeParticipant/j0frta6</a>   |
| P4 | <a href="http://127.0.0.1:8037/InitializeParticipant/vhxyicw8">http://127.0.0.1:8037/InitializeParticipant/vhxyicw8</a> |

Figure 7.1: Instructor start links for a newly created session.



## Welcome

The **Behavioral and Experimental Economics Research Lab** of the Department of Economics at Tecnológico de Monterrey is a space designed to learn about economic decision-making through controlled activities.

In this activity, you will participate in a centralized residency assignment market. Your decisions are private and will be analyzed in aggregate.

### General laboratory rules

- Remain silent and do not talk with other participants.
- Make decisions individually and privately.
- Follow the instructions shown on each screen.
- Do not refresh, close, or leave the page.
- If you have a problem, raise your hand and wait for private assistance.

☐ I have read and accept the laboratory rules.

Start

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Figure 7.2: Laboratory cover, purpose, and rules.



## Matching-market instructions

Deferred acceptance: applicants propose  
One market



## Matching-market instructions

Deferred acceptance: applicants propose  
One market

### 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.

Basic version · Applicant-proposing deferred acceptance

Four applicants compete for positions at four programs. Each program has a capacity and a priority order. You receive private ECU values and submit an ordered list.

### HOW THE MECHANISM WORKS

#### Deferred acceptance: applicants propose

Applicants first propose to their highest-ranked program. Each program tentatively holds its highest-priority applicants up to capacity and rejects the rest. Rejected applicants propose to their next option. The process ends when no new proposal remains.



### Your values and your list

An ECU value is what you earn if assigned to that program. Order the programs according to the list you wish to submit. Nobody will see your individual values or list.

### Program priorities

A priority determines which applicant a program favors when several compete for the same position. It is not a prediction of anyone's decisions. Capacity is the number of positions a program can fill.



Blue Program

Capacity: 1

Priority:

Applicant 1 › Applicant 3 › Applicant 2 › Applicant 4



Turquoise Program

Capacity: 1

Priority:

Applicant 3 › Applicant 1 › Applicant 2 › Applicant 4



Gold Program

Capacity: 1

Priority:

Applicant 4 › Applicant 1 › Applicant 3 › Applicant 2



Coral Program

Capacity: 1

Priority:

Applicant 2 › Applicant 4 › Applicant 1 › Applicant 3

### Algorithm example

If two applicants request the Blue Program, it tentatively holds the applicant with higher priority. The other continues to the next option. A tentative hold can change if a higher-priority applicant arrives later.

### ECU for the round

At the end, you earn your private value for the assigned program. If unmatched, you earn 0 ECU. In repeated sessions, ECU from all rounds are added.

Continue

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Figure 7.4: Current instructions for the basic edition: initial resources, decision rules, and experimental units. Continuation 2/2.



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

## Comprehension check

Applicant 4

### 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.

Applicant-proposing deferred acceptance

Answer correctly before entering the market.

### What is a key property for the applicant side in this version?

- ☐ Under applicant-proposing deferred acceptance, ranking by true preferences is a safe strategy.
- ☒ Acceptances at each step are final and are not reconsidered.
- ☐ Programs make offers and applicants tentatively hold their favorite.
- ☐ Each applicant chooses among remaining positions when their priority turn arrives.
- ☐ An omitted program cannot be assigned to you.
- ☐ Each program's announced capacity.
- ☐ Priorities become decisive because top options are congested.

Your answer: Acceptances at each step are final and are not reconsidered.. The correct answer is Under applicant-proposing deferred acceptance, ranking by true preferences is a safe strategy.. Review the rule: applicants propose, holds are tentative, and truthful ordering is safe for the proposing side.

### What is a blocking pair?

- ☒ An applicant and a program that prefer each other to their current assignments.
- ☐ Any program receiving few applications.

### What determines your ECU for the round?

- ☒ Your private value for the program you finally receive; 0 ECU if unmatched.
- ☐ The number written beside your first choice, regardless of the assignment.

Check answers

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Figure 7.6: Current comprehension check with an incorrect answer, its specific explanation, and retained responses. Continuation 2/2.

## Submit your program list

Round 1 of 1 · Applicant-proposing deferred acceptance

**Applicant 2**

Deferred acceptance: applicants propose

Review your private values, capacities, and priorities. Then select a different program at every position.

### Your private values

|                                                                                                                                          |                                                                                                                                                |                                                                                                                                          |                                                                                                                                            |
|------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------|
| <br><b>Blue Program</b><br><b>75 ECU</b><br>Capacity: 1 | <br><b>Turquoise Program</b><br><b>100 ECU</b><br>Capacity: 1 | <br><b>Gold Program</b><br><b>50 ECU</b><br>Capacity: 1 | <br><b>Coral Program</b><br><b>25 ECU</b><br>Capacity: 1 |
|------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------|

### Priority

#### Blue Program

Applicant 2 › Applicant 1 › Applicant 3  
› Applicant 4

#### Turquoise Program

Applicant 2 › Applicant 4 › Applicant 1  
› Applicant 3

#### Gold Program

Applicant 1 › Applicant 2 › Applicant 4  
› Applicant 3

#### Coral Program

Applicant 3 › Applicant 4 › Applicant 2  
› Applicant 1

### Submit your program list

Applicant-proposing deferred acceptance removes the need to rank a safe option above an option you truly prefer.

#### Choice 1

Select a program

#### Choice 2

Select a program

#### Choice 3

Select a program

#### Choice 4

Select a program

**Submit list**

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Figure 7.7: Ordered program list with private values and priorities.

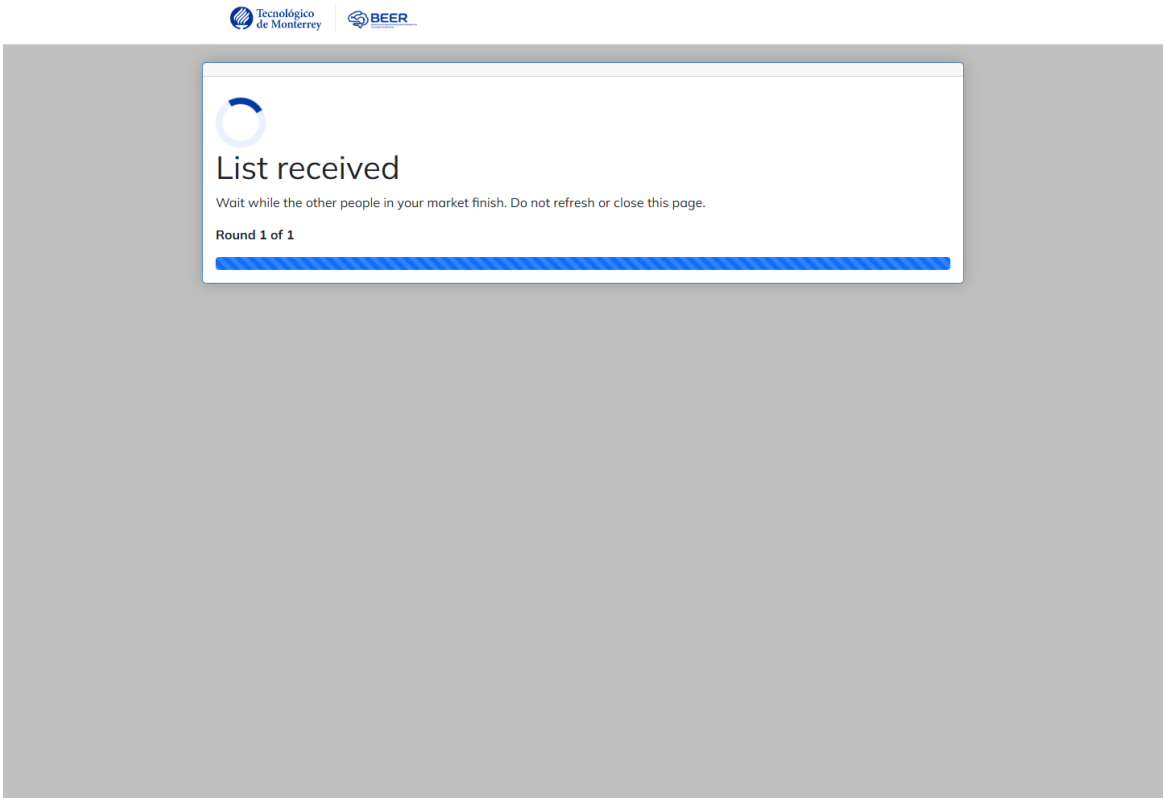


Figure 7.8: Waiting page while the market finishes.

Tecnológico de Monterrey

BEER

Matching outcome

Applicant 2

Round 1 of 1 · Deferred acceptance: applicants propose

YOUR ASSIGNMENT

Blue Program

Position in your true preferences

2

ECU this round

75 ECU

Anonymous market assignment

| Applicant                    | Assignment        |
|------------------------------|-------------------|
| Applicant 1                  | Coral Program     |
| Applicant 2 <span>You</span> | Blue Program      |
| Applicant 3                  | Gold Program      |
| Applicant 4                  | Turquoise Program |

View final summary

Stability under true preferences

5 blocking pairs were identified.

A blocking pair is an applicant and a program that would mutually prefer each other to the current outcome.

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Figure 7.9: Individual result and anonymous market assignment.



Activity completed

Applicant 2

Applicant-proposing deferred acceptance

Activity completed

All your decisions were recorded. Wait for the instructor's directions.

Accumulated ECU

75 ECU

| Round | Assignment   | True rank | ECU | Truthful list |
|-------|--------------|-----------|-----|---------------|
| 1     | Blue Program | 2         | 75  | No            |

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Figure 7.10: Explicit completion message and personal history.

# Instructor report and disciplined interpretation

The report starts with participants, completed decisions, pending decisions, and completed markets. Aggregates remain hidden while an expected choice is missing. The reveal button is disabled. This rule prevents partial results from influencing unfinished decisions. Once all participants finish, the instructor chooses when to reveal.

Mean ECU uses completed individual decisions. First choice is the fraction assigned to the program with the highest private value. Truthful lists compare submissions with induced orders. Stable markets and mean blocking pairs use completed markets. The unmatched rate returns to individual applicants. Do not mix denominators: four people in one market are not four independent markets.

The assignment histogram shows how many applicants receive each program or remain unmatched. The rank histogram displays first through fourth choice plus unmatched. It is more informative than an average rank: two markets can share the same mean while differing sharply in extremes. The round table tracks first choices, truthful lists, stability, and ECU over time.

Report stability is computed under induced true preferences and program priorities. Deferred acceptance guarantees stability under submitted lists. If a submitted list is not truthful, a blocking pair may appear under true preferences. That distinction is a teaching opportunity. Do not say the algorithm “failed” without naming the preference object used to assess stability.

Read the report in four steps. First, verify completion and denominators. Second, describe distributions without explaining them. Third, compare outcomes with a prediction recorded before reveal. Fourth, propose mechanisms and identify additional evidence. “The truthful-list rate was 72 percent among 40 decisions” is a fact. Confusion and strategic response are compatible explanations. Randomly assigned treatments would help distinguish them.

## Feedback script

Ask what students see in the distributions before presenting a theory. Then introduce one property and return to the evidence: “Applicant-proposing DA protects truthful ordering. Does the list distribution approach that benchmark? What evidence would separate confusion from manipulation?” End by distinguishing stability, first choices, and total ECU.

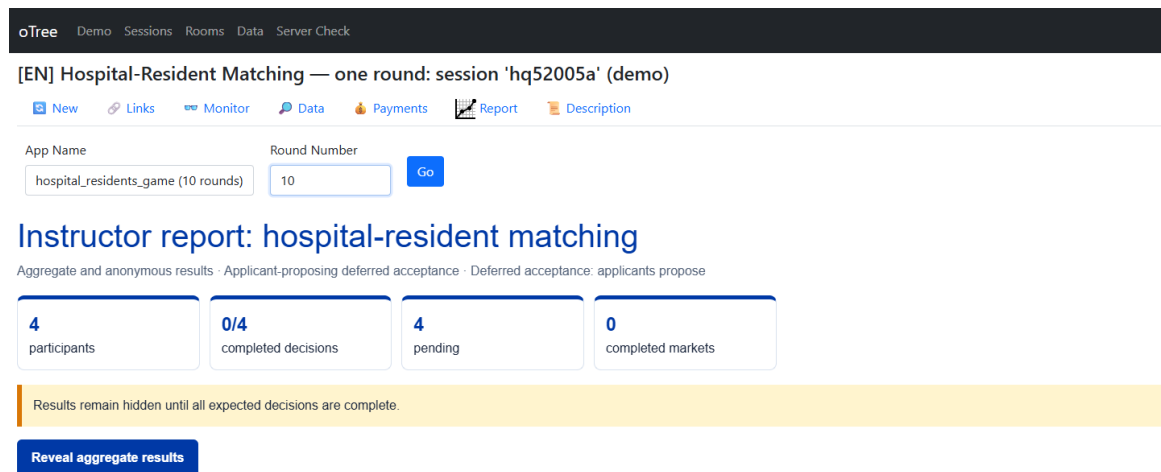


Figure 8.1: Instructor report hidden while decisions remain pending.

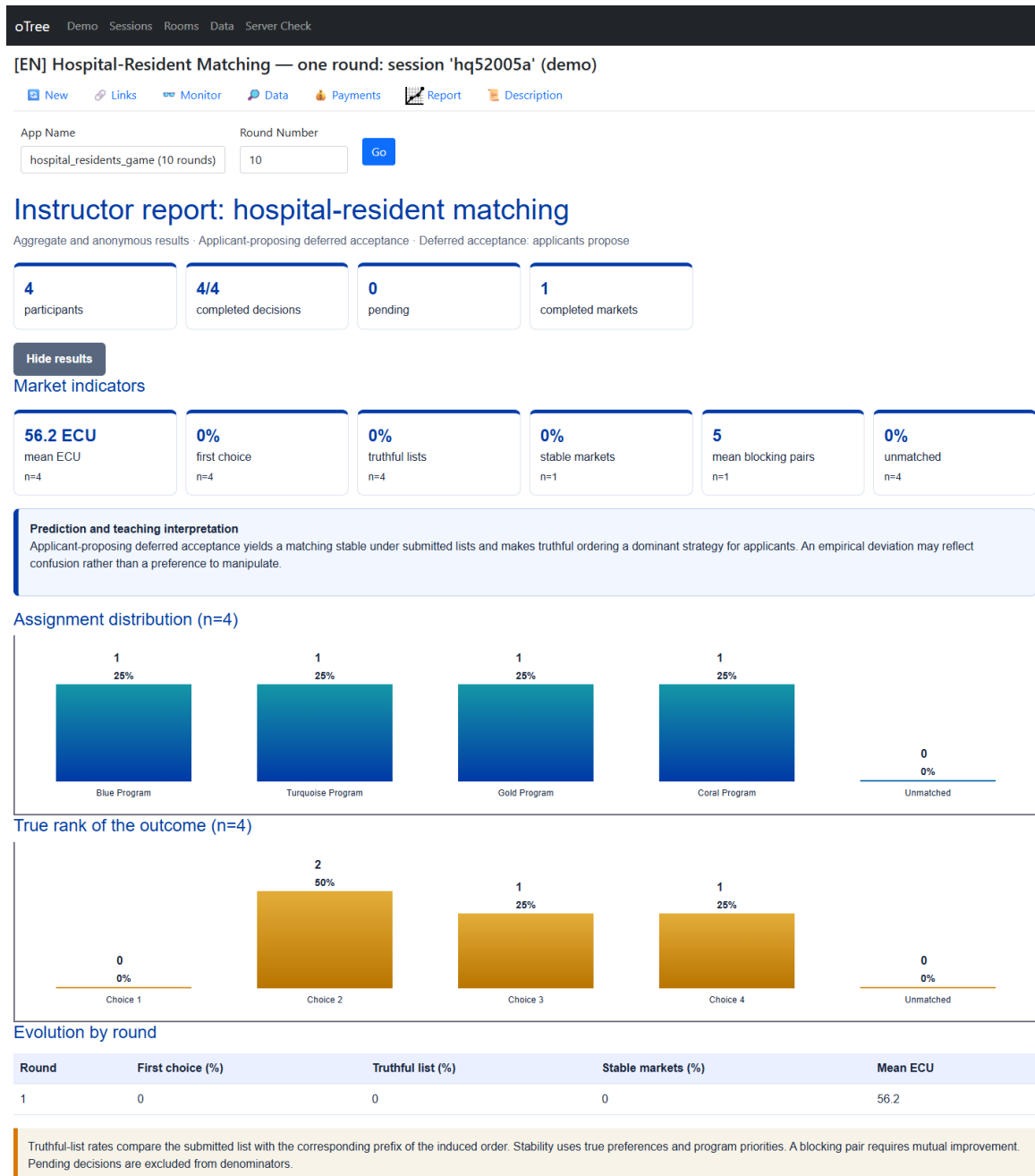


Figure 8.2: Revealed report with indicators, histograms, and evolution.

---

# Extended variants

## 9.1 Immediate acceptance

Acceptances at each step are final. A safe program may fill while an applicant first requests a competitive program. The central strategic question is whether a list should reflect preferences or admission prospects. Compare truthful-list rates, true ranks, and blocking pairs with applicant-proposing DA.

Before reveal, request a two-applicant, two-program example where listing the favorite first harms someone under immediate acceptance. Ask whether a nontruthful list reflects error or rational response to the rule. School-choice research shows that a mechanism can shift the burden of anticipating competition onto participants.

## 9.2 Program-proposing deferred acceptance

Programs propose in priority order, and applicants hold their favorite offer. The result is stable under submitted lists but program optimal within the stable set. A valid comparison fixes preferences, priorities, and capacities. Compare assignment, ECU, and true ranks, while recognizing that not every market must produce a difference.

Applicants no longer enjoy the same revelation guarantee. This treatment raises an institutional design question: which side should propose? In labor markets, universities, and platforms, the answer can distribute gains even when both outcomes are stable.

## 9.3 Priority serial dictatorship

Applicants choose one by one using the Blue Program's priority order. Each person receives the highest listed program with a remaining position. Truthful ordering is straightforward and the result is efficient for applicants given that order, but it can violate the specific priorities of other programs.

Ask where power enters the rule. A common priority determines turns despite program-specific priorities. If blocking pairs arise, display one and identify the ignored priority. The term "dictatorship" names a sequential choice rule, not a moral conclusion.

Matching-market instructions

Extended version · Immediate acceptance

Immediate acceptance  
Fixed market

Four applicants compete for positions at four programs. Each program has a capacity and a priority order. You receive private ECU values and submit an ordered list.

HOW THE MECHANISM WORKS

Immediate acceptance

At each step, unassigned applicants apply to their next program. Each program permanently accepts its highest-priority applicants until capacity is filled. An early acceptance is not reconsidered later.

1

Your private values

→

2

Priority

→

3

Assignment

Your values and your list

An ECU value is what you earn if assigned to that program. Order the programs according to the list you wish to submit. Nobody will see your individual values or list.

Program priorities

A priority determines which applicant a program favors when several compete for the same position. It is not a prediction of anyone's decisions. Capacity is the number of positions a program can fill.



Blue Program

Capacity: 1

Priority:

Applicant 3 › Applicant 1 › Applicant 2 › Applicant 4



Turquoise Program

Capacity: 1

Priority:

Applicant 2 › Applicant 3 › Applicant 1 › Applicant 4



Gold Program

Capacity: 1

Priority:

Applicant 3 › Applicant 2 › Applicant 1 › Applicant 4



Coral Program

Capacity: 1

Priority:

Applicant 3 › Applicant 2 › Applicant 1 › Applicant 4

Algorithm example

If two applicants request the Blue Program, it tentatively holds the applicant with higher priority. The other continues to the next option. A tentative hold can change if a higher-priority applicant arrives later.

ECU for the round

At the end, you earn your private value for the assigned program. If unmatched, you earn 0 ECU. In repeated sessions, ECU from all rounds are added.

Continue

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Figure 9.1: Immediate acceptance: early assignments are final.

26



Matching-market instructions

Extended version · Program-proposing deferred acceptance

Deferred acceptance: programs propose  
Fixed market

Four applicants compete for positions at four programs. Each program has a capacity and a priority order. You receive private ECU values and submit an ordered list.

HOW THE MECHANISM WORKS

Deferred acceptance: programs propose

Programs propose in priority order until capacity is filled. Each applicant tentatively holds the preferred offer and rejects the rest. The outcome is stable, but it favors the proposing side within the set of stable matchings.

1 Your private values

→

2 Priority

→

3 Assignment

Your values and your list

An ECU value is what you earn if assigned to that program. Order the programs according to the list you wish to submit. Nobody will see your individual values or list.

Program priorities

A priority determines which applicant a program favors when several compete for the same position. It is not a prediction of anyone's decisions. Capacity is the number of positions a program can fill.

Blue Program

Capacity: 1

Priority:

Applicant 1 › Applicant 2 › Applicant 4 › Applicant 3

Turquoise Program

Capacity: 1

Priority:

Applicant 1 › Applicant 4 › Applicant 3 › Applicant 2

Gold Program

Capacity: 1

Priority:

Applicant 1 › Applicant 4 › Applicant 3 › Applicant 2

Coral Program

Capacity: 1

Priority:

Applicant 3 › Applicant 1 › Applicant 2 › Applicant 4

Algorithm example

If two applicants request the Blue Program, it tentatively holds the applicant with higher priority. The other continues to the next option. A tentative hold can change if a higher-priority applicant arrives later.

ECU for the round

At the end, you earn your private value for the assigned program. If unmatched, you earn 0 ECU. In repeated sessions, ECU from all rounds are added.

Continue

Powered by oTree

Figure 9.2: Deferred acceptance with programs proposing.



## Matching-market instructions

Extended version - Priority serial dictatorship

Serial dictatorship

Fixed market

Four applicants compete for positions at four programs. Each program has a capacity and a priority order. You receive private ECU values and submit an ordered list.

### HOW THE MECHANISM WORKS

#### Serial dictatorship

Applicants choose one at a time in the Blue Program's priority order. Each person receives the highest-ranked program among positions still available.



#### Your values and your list

An ECU value is what you earn if assigned to that program. Order the programs according to the list you wish to submit. Nobody will see your individual values or list.

#### Program priorities

A priority determines which applicant a program favors when several compete for the same position. It is not a prediction of anyone's decisions. Capacity is the number of positions a program can fill.



Blue Program

Capacity: 1

Priority:

Applicant 2 › Applicant 4 › Applicant 1 › Applicant 3



Turquoise Program

Capacity: 1

Priority:

Applicant 3 › Applicant 2 › Applicant 1 › Applicant 4



Gold Program

Capacity: 1

Priority:

Applicant 3 › Applicant 4 › Applicant 1 › Applicant 2



Coral Program

Capacity: 1

Priority:

Applicant 4 › Applicant 3 › Applicant 2 › Applicant 1

#### Algorithm example

If two applicants request the Blue Program, it tentatively holds the applicant with higher priority. The other continues to the next option. A tentative hold can change if a higher-priority applicant arrives later.

#### ECU for the round

At the end, you earn your private value for the assigned program. If unmatched, you earn 0 ECU. In repeated sessions, ECU from all rounds are added.

Continue

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Figure 9.3: Serial dictatorship with priority-determined order.

## 9.4 Lists limited to two programs

Applicants may submit only two choices. Omitted programs are unacceptable and cannot be assigned even with vacancies. This represents administrative constraints or processing costs. Compare unmatched applicants, prefix truthfulness, true stability, and program occupancy.

A constrained list may leave an applicant unmatched despite a program worth 25 or 50 ECU having a vacancy. Ask whether administrative simplicity shifts risk onto participants. Truthful ordering within permitted positions does not eliminate the strategic decision about inclusion.



### Submit your program list

Round 1 of 10 · List limited to two programs

Applicant 4

Deferred acceptance: applicants propose

Review your private values, capacities, and priorities. Then select a different program at every position.

#### Your private values

| Program           | Value (ECU) | Capacity    |
|-------------------|-------------|-------------|
| Blue Program      | 75 ECU      | Capacity: 1 |
| Turquoise Program | 25 ECU      | Capacity: 1 |
| Gold Program      | 100 ECU     | Capacity: 1 |
| Coral Program     | 50 ECU      | Capacity: 1 |

#### Submit your program list

You may submit only two options. Other programs remain outside your list and cannot be assigned to you.

Choice 1

Choice 2

[Submit list](#)

#### Priority

**Blue Program**  
Applicant 4 › Applicant 2 › Applicant 1 › Applicant 3

**Turquoise Program**  
Applicant 3 › Applicant 1 › Applicant 4 › Applicant 2

**Gold Program**  
Applicant 1 › Applicant 4 › Applicant 2 › Applicant 3

**Coral Program**  
Applicant 1 › Applicant 4 › Applicant 3 › Applicant 2

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Figure 9.4: Decision screen with only two permitted positions.

## 9.5 Unequal capacities

The Blue Program offers two positions while each other program offers one. Total capacity exceeds applicant count, but demand may remain congested. DA applies quotas and holds applicants up to each announced capacity. Compare assignments and first choices with unit capacities.

An extra position can reduce congestion and blocking pairs but need not give everyone a first choice. Use the treatment to connect matching with capacity planning. A new position where

nobody wishes to go differs from expansion at a congested program.



## Submit your program list

Round 1 of 10 · Unequal capacities

Applicant 1

Deferred acceptance: applicants propose

Review your private values, capacities, and priorities. Then select a different program at every position.

### Your private values

| Program           | Value (ECU) | Capacity    |
|-------------------|-------------|-------------|
| Blue Program      | 100 ECU     | Capacity: 2 |
| Turquoise Program | 25 ECU      | Capacity: 1 |
| Gold Program      | 50 ECU      | Capacity: 1 |
| Coral Program     | 75 ECU      | Capacity: 1 |

| Priority                                                                          |
|-----------------------------------------------------------------------------------|
| <b>Blue Program</b><br>Applicant 1 › Applicant 4 › Applicant 3 › Applicant 2      |
| <b>Turquoise Program</b><br>Applicant 2 › Applicant 4 › Applicant 1 › Applicant 3 |
| <b>Gold Program</b><br>Applicant 2 › Applicant 4 › Applicant 1 › Applicant 3      |
| <b>Coral Program</b><br>Applicant 1 › Applicant 4 › Applicant 2 › Applicant 3     |

### Submit your program list

Notice that the Blue Program offers two positions. Every other program offers one.

#### Choice 1

Select a program

#### Choice 2

Select a program

#### Choice 3

Select a program

#### Choice 4

Select a program

Submit list

Powered by [oTree](#)

Figure 9.5: Private values, priorities, and two positions at the Blue Program.

## 9.6 Aligned preferences and congestion

All applicants value programs Blue, Turquoise, Gold, and Coral in the same order. Priorities determine who receives top options. A 25 percent first-choice rate follows mechanically from one Blue position for four applicants; it is not evidence of an inefficient algorithm.

This treatment creates a quantitative benchmark. With one position per program, no more than one-quarter can receive the shared favorite. Compare the observed rank distribution with that bound. Then ask which intervention changes the feasible set: a different priority, extra capacity, or less correlated preferences.

## Submit your program list

Round 1 of 10 · Aligned preferences and congestion

Applicant 2

Deferred acceptance: applicants propose

Review your private values, capacities, and priorities. Then select a different program at every position.

### Your private values

|                                                                                                                                           |                                                                                                                                               |                                                                                                                                          |                                                                                                                                           |
|-------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------|
| <br><b>Blue Program</b><br><b>100 ECU</b><br>Capacity: 1 | <br><b>Turquoise Program</b><br><b>75 ECU</b><br>Capacity: 1 | <br><b>Gold Program</b><br><b>50 ECU</b><br>Capacity: 1 | <br><b>Coral Program</b><br><b>25 ECU</b><br>Capacity: 1 |
|-------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------|

### Priority

#### Blue Program

Applicant 1 › Applicant 2 › Applicant 3  
› Applicant 4

#### Turquoise Program

Applicant 1 › Applicant 4 › Applicant 3  
› Applicant 2

#### Gold Program

Applicant 3 › Applicant 1 › Applicant 4  
› Applicant 2

#### Coral Program

Applicant 4 › Applicant 3 › Applicant 1  
› Applicant 2

### Submit your program list

Class preferences may concentrate on the same programs. Use your own values to order them.

#### Choice 1

Select a program

#### Choice 2

Select a program

#### Choice 3

Select a program

#### Choice 4

Select a program

Submit list

Powered by [oTree](#)

Figure 9.6: Aligned values: every applicant competes for the same order.

---

## A 60-minute debrief plan

Use the first five minutes to recover written predictions. Do not open the report. Ask one student to define a blocking pair and another to explain tentative holding. Correct concepts without discussing outcomes. This makes clear which claims came from theory before seeing data.

During the next ten minutes, reveal completion, number of markets, and histograms. Describe assignments and ranks. Ask what students observe and write only facts: percentages, denominators, and distribution shapes. Do not begin with a mean that can hide unmatched applicants or polarized outcomes.

Use fifteen minutes to reconstruct one prepared anonymous market. Execute proposals, holds, and rejections. Test a pair that looks attractive and establish why it does or does not block. If the treatment produced true blocking pairs, show both conditions: applicant improvement and program vacancy or priority improvement.

Reserve ten minutes for incentives. Compare truthful-list rates with the theoretical property. Ask for three explanations for deviations and classify each as strategy, error, or experimentation. Ask what added design would distinguish them: repeated feedback, elicited beliefs, immediate acceptance, or simplified information.

Use ten minutes for institutional comparison. What changes if programs propose? What objective does a priority protect? Should list length be unlimited? Does extra capacity improve welfare? Require every answer to name a criterion: stability, ECU, first choices, unmatched rate, or equity.

Close with five to ten minutes of synthesis. Record four conclusions: a mechanism converts information into assignment; stability eliminates bilateral deviations; incentives depend on the proposing side and whether acceptances are tentative; and normative evaluation requires several metrics. Ask for an application in which free prices are unavailable and one danger of transferring the simplified model without adaptation.

# Workshop: twelve solved markets

## 11.1 Case 1: dispersed preferences

The four applicants have distinct first choices. Every program has one position and places first the applicant who values it most. All first-step proposals can be held. The algorithm terminates with everyone earning 100 ECU and no blocking pair. A sophisticated mechanism can produce a simple outcome when there is no congestion.

Ask whether lack of conflict means every mechanism must agree. Not necessarily: an odd sequential rule could differ, while immediate acceptance agrees here only because first choices do not compete. Separate a general mechanism property from a coincidence driven by parameters.

## 11.2 Case 2: two applicants want Blue

Applicants 1 and 2 rank Blue first. Blue prioritizes 2. Applicant 1 ranks Turquoise second and has high priority there. DA holds 2 at Blue, rejects 1, and then holds 1 at Turquoise. Applicant 1 prefers Blue, but the pair does not block because Blue prefers its current occupant. Unilateral dissatisfaction is insufficient.

If Blue is worth 100 to both and Turquoise 75 to applicant 1, the outcome can be stable while someone misses a favorite. Reverse Blue's priority without changing the assignment to create a blocking pair. The comparison shows that stability uses both sides.

## 11.3 Case 3: a tentative hold changes

Applicant 1 proposes to Blue and is held. Applicant 2 proposes to Turquoise, is rejected, and then proposes to Blue. Blue ranks 2 over 1 and displaces 1, who continues to the next option. The first hold was never a final promise.

Under immediate acceptance, Blue would have closed with 1 and could not reconsider. Compare outcomes and search for a blocking pair in the immediate mechanism. The distinction comes from the rule stated in the instructions, not from an intuitive fairness judgment.

## 11.4 Case 4: proposing sides

Construct a market with at least two stable matchings. Run applicant proposals and then program proposals. Record every applicant's true rank. The first mechanism selects the applicant-optimal

stable outcome, while the second favors programs.

Students must verify stability of both outcomes rather than assume only one can be stable. They should identify winners and losers from the change. The case prevents conflating stability with uniqueness and shows that an institutional choice distributes advantage while preserving a desirable property.

## 11.5 Case 5: immediate acceptance and a safe option

An applicant prefers Blue but has low priority there and high priority at Turquoise. Many applicants request Turquoise first. Listing Blue first under immediate acceptance can lead to rejection after Turquoise fills. A strategic list places Turquoise first and sacrifices the chance at Blue to protect an assignment.

Under DA, requesting Blue first does not lose Turquoise merely because others applied earlier: Turquoise holds by priority, not chronological order. Ask why the same list can be sensible under one rule and unnecessary under another.

## 11.6 Case 6: truncated list and vacancy

An applicant lists Blue and Turquoise and is rejected by both. Gold has a vacancy and is worth 50 ECU, yet cannot be assigned because it was omitted. The payoff is zero. A vacancy and unmatched applicant coexist without violating the submitted list.

Under true preferences, the applicant and Gold may block. Under the submitted message, Gold was declared unacceptable. Ask which object should define stability when messages are constrained. This reveals the informational cost of short lists.

## 11.7 Case 7: additional capacity

Blue has two positions. Three applicants rank it first. It holds the two highest priorities and rejects the third. Relative to one position, at least one applicant improves and congestion falls, but the third may still receive a lower option.

With aligned preferences and two Blue positions, at most two of four applicants can obtain a first choice, or 50 percent. This is a mechanical bound. Observing exactly 50 percent does not prove truthful reporting; submitted lists must also be examined.

## 11.8 Case 8: serial dictatorship and instability

Order of choice follows Blue's priority. Applicant 1 selects Turquoise before applicant 2 acts. Turquoise, however, gives applicant 2 higher priority. If 2 prefers Turquoise to the assigned program, the pair blocks. The rule is simple for applicants but does not respect every program-specific priority.

Ask what institution could justify a common priority, such as a national score or lottery. Then ask what is lost if programs have legitimate separate criteria. Mechanism performance depends on which priority rights the institution recognizes.

## 11.9 Case 9: aligned preferences

Everyone ranks Blue, Turquoise, Gold, and Coral. With unit capacities and complete lists, one applicant ultimately receives each rank under an assignment that fills every program. The first-choice rate is 25 percent and the average rank can be 2.5.

That average does not reveal mechanism failure; no feasible assignment can give Blue to more than one person. Compare total ECU, stability, and rank inequality. Expanding Blue changes the feasible set, while changing the algorithm alone does not remove scarcity.

## 11.10 Case 10: a nontruthful list under DA

An applicant values Blue at 100 and Turquoise at 75 but submits Turquoise first and receives it. The report marks the list as nontruthful, but motivation remains unknown. The applicant may mistakenly view Blue as too competitive or may be experimenting.

Ask what evidence would distinguish explanations: elicited admission beliefs, repetition with feedback, hidden priorities, or a post-session questionnaire. Matching theory classifies strategies; psychological motives require additional measurement.

## 11.11 Case 11: declared and true stability

DA produces stability under submitted lists. If some lists differ from induced true preferences, the outcome may have blocking pairs under private values. Both statements can be correct. The report uses true preferences so the class can see consequences of strategic or mistaken submissions.

Always name the reference object. “Stable under submitted lists” states an algorithmic property. “Unstable under induced values” describes behavior and outcome. Omitting that precision creates an apparent contradiction.

## 11.12 Case 12: multidimensional evaluation

Mechanism A yields 70 percent first choices, 5 percent unmatched, and 20 percent stable markets. Mechanism B yields 55 percent first choices, nobody unmatched, and 100 percent stability. There is no automatic normative ranking.

Assign groups to represent applicants, programs, and a regulator. Each proposes a criterion and weight. Then identify missing information: cardinal preference intensity, program objectives, vacancy costs, equity, and administrative feasibility. Market design cannot be reduced to one indicator.

## 11.13 Experimental design and data use

The independent unit in one round is a market, not an applicant. Four decisions jointly determine assignments and stability. In ten fixed-market rounds, the ten rounds are not independent markets because participants share history. Statistical work should cluster or aggregate at the treatment-assignment level and respect the design.

To compare mechanisms, assign markets before observing outcomes. Hold language, values, priorities, capacities, incentives, rounds, and information constant except for the intended treatment.

Comparing a one-round Spanish baseline with a ten-round English extension confounds mechanism, experience, and language.

Individual variables include truthful list, program, true rank, first choice, ECU, and unmatched status. Market variables include stability and blocking pairs. Beliefs or prior experience can be added in a documented extension, but do not alter measurement during a session. Record interruptions and replacements.

The report supports immediate feedback; it is not a research protocol. For research, preregister hypotheses, exclusions, and models before inspecting outcomes. For teaching, anonymous aggregates are usually sufficient and protect privacy. Do not download or project identifying information without an institutional basis.

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# Troubleshooting

If Demo shows other families, the instance is not filtered. Check `GAME_FAMILY`, restart the process, and confirm 24 configurations. If a room lists every configuration, verify the exact room name and common filter. Do not solve the problem by giving students access to Demo.

If a participant sees “Please wait,” locate the market in Monitor. Someone may still be on comprehension or ranking. Do not refresh the wait page or submit a list for the student. If a computer disconnects, recover the same participant link. A new link creates another identity and leaves the original market incomplete.

If oTree reports that a user does not exist, the link belongs to a reset database or another instance. Create a fresh session and distribute current links. Never run `resetdb` on production during class. If an old path returns Not Found, use the family’s room and verify the deployed commit.

If the report stays hidden, inspect pending decisions. Protection is intentional. If four applicants see results but one pending item remains, verify the session, active rounds, and report tab. Do not disable the reveal guard. An unmatched applicant under truncated lists may be a valid outcome.

If formatting breaks, confirm static assets deployed. The oTree title block must stay empty so the visual heading is not duplicated. Debug information must not appear in production; verify `OTREE_PRODUCTION=1`, authentication, and the server configuration.

## 12.1 Course adaptation and future extensions

In intermediate microeconomics, use the activity to introduce allocation without prices, capacity constraints, and efficiency. In game theory, emphasize algorithms, deviations, and stability. In labor economics, connect to medical matching, early contracting, and platforms. In education economics, compare immediate acceptance and DA. In public policy, discuss priorities, transparency, affirmative action, and capacity.

For an introductory course, omit formal proofs and solve a two-by-two example first. For an advanced course, prove termination and stability, construct multiple stable matchings, and characterize changes when the proposing side switches. For experimental methods, use the distinction between applicants and markets to discuss units of observation.

Do not change many elements simultaneously. A teaching extension may add an outside option, a common priority, or more programs. Every change should state the question, prediction, and valid report metric. Realism without a research or teaching question can make the mechanism opaque.

Future families might add applicant couples, category reserves, tied priorities, contracts with wages, or active programs. These extensions require new logic and theoretical properties; they are not simple text changes to the current activity.

## 12.2 Ethics, accessibility, and limits

Preferences are induced, and programs use neutral colors and icons. Do not associate colors with actual universities, prestige, gender, origin, or merit. Priorities are rules of the exercise, not judgments about personal ability. Reinforce this during the debrief so that a low priority is not understood as an evaluation of a student.

The interface uses text and labels in addition to color. Test zoom and resolution. If someone needs a screen reader or extra time, prepare the accommodation without disclosing that need. Decisions remain private even if general instructions are read aloud.

Do not use the activity to allocate real course opportunities. It is a teaching tool with artificial values and priorities. Do not infer personality or ability from a nontruthful list. Analyze results in aggregate and retain them under institutional data policies.

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# Frequently asked instructor questions

## 13.1 Why are programs automated?

The activity focuses on applicants because it can compare induced preference, submitted list, and outcome. Programs apply fixed priorities, which isolates the mechanism. Human-controlled programs would need an additional message space, rules for multiple positions, and a new incentive analysis. That is useful, but it is a different experiment and needs more participants.

Automation does not remove strategic interaction. Every applicant list combines with all others, program priorities, and capacities. No person can infer the assignment from an individual screen. The market remains the experimental unit. “Automated” means institutional behavior is fixed; it does not mean the outcome is predetermined.

## 13.2 Why show priorities when truthful ranking is safe under DA?

Priorities let students execute and verify the algorithm. They define stability and are essential for comparing immediate acceptance, serial dictatorship, and unequal capacity. Hiding them could reduce strategic calculation but would prevent students from understanding holds and rejections. The baseline lesson is precisely that seeing a low priority need not force a safe option above a preferred one under applicant-proposing DA.

Ask during the debrief whether priorities affected rankings, without identifying anyone. If belief measurement is central, add a separate planned elicitation. Do not improvise an identifying question after observing submissions.

## 13.3 Why does the report use true preferences?

The mechanism sees submitted messages, so its formal stability property concerns those messages. The experiment also induces values, allowing welfare and deviations to be evaluated under the underlying preference order. Both layers matter. An assignment can be stable under lists and blocked under induced values.

“True” means induced by ECU in the activity. It does not assert that participants care about fictional program colors outside the exercise. Monetary or meaningful incentive conversion strengthens the behavioral interpretation, while classroom points mainly support illustration.

### 13.4 Does a high truthful-list rate prove strategy dominance?

No. Dominance is a theoretical comparison across every behavior profile of others. A high rate is consistent with understanding, but it can also follow from a simple sort-by-value heuristic. A low rate does not refute the theorem because participants may err or pursue other goals. Keep theoretical and empirical claims separate.

For learning, examine whether truthfulness changes over fixed-market rounds. That pattern remains descriptive because experience and history move together. A causal design would assign different explanations or feedback rules across markets.

### 13.5 Is first choice the best performance measure?

It is intuitive but incomplete. If everyone prefers one program and it has one position, the maximum first-choice rate is 25 percent. No algorithm can beat physical capacity. True-rank distributions, unmatched rates, ECU, and stability answer different questions. Total ECU is cardinal; rank is ordinal; stability incorporates program priorities.

Choose the institutional objective before class. If bilateral deviations matter, examine stability. If access matters, examine unmatched applicants. If applicant welfare matters, use ECU and ranks. If legitimacy matters, discuss priority respect and transparency. The report does not choose the objective.

### 13.6 Can the game run with fewer than four applicants?

The current configuration requires multiples of four. Fewer applicants make instructions, priorities, capacities, charts, and examples inconsistent. Do not change participant count in Demo as a quick fix. With a small class, four students can decide while others observe, or the instructor can use screenshots and solve a market together.

Expanding to five or six applicants requires revising code, values, icons, comprehension, algorithms, tests, report, and guides. Changing `num_demo_participants` is not enough. Consistency among model, interface, and documentation is part of the product.

### 13.7 Should the same market repeat?

Fixed markets support shared learning: applicants observe outcomes, form expectations, and adjust lists. They also create dependence and history. Reassignment reduces continuity among rivals but does not make one person's repeated decisions independent. One-shot play gives a clean pre-feedback observation but contains more comprehension noise.

Choose based on the question. Use one round to teach the algorithm, fixed repetition for convergence, and reassignment to discuss adaptation without stable membership. Do not describe a difference as a pure regrouping effect if rounds or session size also change.

### 13.8 What if an applicant is unmatched?

First check the treatment. Unmatched outcomes are expected with truncated lists. With complete lists, four programs, and unit capacities, everyone should ordinarily receive a program. If not,

inspect submitted lists, capacities, and market records. Never edit the outcome during a session. Do not expose the unmatched participant. Use an aggregate rate and a fictitious example. Explain that zero ECU follows the rule and does not measure ability. If ECU convert to money, the zero possibility must have been announced in advance.

### **13.9 How can two treatments be compared in one class?**

Divide students into complete markets and assign markets to configurations before generating links. Keep language, rounds, incentives, and group size constant. Prevent communication until both conditions finish. Count markets, not merely people: eight participants per treatment provide only two market units.

Show distributions by treatment and then differences. If assignment or sample size is weak, say “this class displayed a larger rate” rather than “the mechanism increased the rate.” The session can teach experimental design as well as matching.

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# Additional teaching notes and worked calculations

## 14.1 From private values to ranks and ECU

Suppose Applicant 1 receives values Blue 75, Turquoise 25, Gold 100, and Coral 50. The induced order is Gold, Blue, Coral, Turquoise. Assignment to Blue produces a true rank of two and a payoff of 75 ECU. Assignment to Turquoise produces rank four and 25 ECU. Remaining unmatched produces no ordinal rank in the report and a payoff of zero.

This example separates a rank from a cardinal payoff. Moving from the first to second choice costs 25 ECU here, while moving from the third to fourth also costs 25 because the activity uses equal value steps. A future design could use unequal gaps. In the current family, total ECU and average rank contain related but nonidentical information because unmatched status adds a zero outcome outside the four ranks.

Ask students to predict the report row before revealing it. They should name assigned program, true rank, ECU, and whether the submitted list was truthful. If the applicant submitted Blue, Gold, Coral, Turquoise, receiving Blue still pays 75 ECU and has true rank two. The list is nontruthful even though the assigned program is listed first. Payoff follows induced value, while truthfulness compares complete order.

## 14.2 Checking a blocking pair carefully

Suppose Applicant 1 is assigned Coral but prefers Blue and Gold. Blue is occupied by Applicant 2, whom Blue ranks above Applicant 1. Gold is occupied by Applicant 3, but Gold ranks Applicant 1 above Applicant 3. The pair (Applicant 1, Blue) does not block because only the applicant would improve. The pair (Applicant 1, Gold) does block: Applicant 1 prefers Gold to Coral and Gold would replace its current occupant with Applicant 1.

If Gold had an empty position, its priority comparison would not be needed; vacancy plus applicant improvement is enough. If Applicant 1 omitted Gold from a constrained submitted list, the pair does not block under submitted acceptability but may block under induced true preferences. State the reference every time.

Have students audit a report value by examining all applicant-program combinations in a prepared market. With four applicants and four programs there are at most sixteen pairs, fewer after excluding assigned pairs and programs below the current assignment. This finite exercise makes the stability statistic transparent rather than treating it as a black box.

### 14.3 A proposal table for the board

Prepare columns labeled step, applicant, proposal, program hold, and rejection. At step one, record all four first proposals. If three apply to Blue, list all three before applying priority. Mark the highest priority as held and the remaining two as rejected. At step two, only rejected applicants propose again. A program that receives no new proposal retains its current hold.

Continue until no rejection generates another proposal. Then convert holds to assignments. Preserve every row so that students can trace why a particular pair does not block: an applicant who prefers a program must have proposed there and been rejected in favor of a higher-priority final assignee. For truncated lists, write “no remaining acceptable option” when the second rejection occurs.

The same table highlights immediate acceptance. Replace “hold” with “final assignment” and reduce remaining capacity after each step. A later higher-priority applicant cannot displace an early assignee. Comparing the completed tables works better than repeating that one acceptance is tentative and the other final.

### 14.4 Questions that diagnose understanding

Ask, “If a program holds you in step one, are you guaranteed that position?” The correct answer is no under deferred acceptance and yes under immediate acceptance. Ask, “If you are rejected by a program, can you return later?” Under DA, no: the program’s held set only improves by its priority. Ask, “Does a low priority mean you should rank a program lower under applicant-proposing DA?” No, because truthful ordering remains safe.

Ask, “Can a stable outcome leave someone without a first choice?” Yes. “Can it leave someone unmatched?” Yes when capacity or acceptable lists make that necessary. “Can an unstable outcome have a high total ECU?” Yes, because efficiency and stability are different criteria. “Can two stable outcomes exist?” Yes, and proposing-side optimality orders them.

Use wrong answers diagnostically rather than as labels. Confusing tentative and final acceptance suggests revisiting the flow diagram. Treating priority as preference suggests reconstructing the two sides. Equating stability with first-choice assignment suggests working through a blocking-pair example. The platform’s comprehension gate confirms minimum answers, but discussion reveals deeper misconceptions.

### 14.5 Interpreting learning across rounds

Suppose truthful lists rise from 50 percent in round one to 88 percent in round ten, first-choice assignments remain near 40 percent, and stable markets under true preferences rise from 25 to 75 percent. A plausible narrative is that applicants learn to report induced preferences, which aligns true and submitted stability. The unchanged first-choice rate may reflect fixed scarcity rather than lack of learning.

That narrative is not yet causal. Markets share history, values may change by round, and applicants may imitate patterns. A fixed group also learns about the same rivals, while reassigned markets change composition. Present the pattern as evidence consistent with learning, then ask what design would strengthen the claim: a no-feedback control, randomized explanation, or comparison of first and final rounds across independent markets.

If truthfulness falls under immediate acceptance, the direction may reflect strategic adaptation

rather than deterioration. A “truthful” metric is not always a performance score. Under an incentive-incompatible mechanism, a nontruthful list may protect the applicant. Interpret each measure relative to the mechanism’s incentives.

## 14.6 Connecting the game to policy without overclaiming

For school choice, priorities may represent neighborhood, sibling status, lottery numbers, or policy categories. For medical matching, programs rank applicants and applicants rank programs. For public housing, capacity and eligibility rules matter. For course allocation, students rank sections and institutions may prioritize majors or graduating students. The mathematical language travels, but institutional details differ.

Ask students which side possesses choice rights, whether priorities are legitimate, whether transfers are allowed, and whether preferences are responsive. Couples, complementarities, affirmative-action reserves, and regional constraints can change theoretical properties. A stable mechanism in the simple model is a starting point for institutional analysis, not a universal prescription.

Policy evaluation should include implementation. Are priorities transparent? Can applicants understand the list? Is the option set manageable? Do participants trust that reported rankings are used as announced? Are appeals possible? Strategy-proofness on paper does not guarantee good outcomes if people misunderstand the rule or lack access to information.

## 14.7 A concise closing explanation

The instructor can close with four linked sentences. First, matching mechanisms allocate scarce positions using preferences, priorities, and capacities when prices are unavailable or undesirable. Second, deferred acceptance uses tentative holds to produce stability. Third, applicant-proposing DA protects truthful ordering for applicants, while alternative rules may require strategic forecasts. Fourth, choosing a mechanism still requires normative judgments about priorities, capacity, equity, and the side that receives favorable stable outcomes.

Then return to the class evidence. Name one distribution, one denominator, and one theoretical benchmark. Identify one compatible explanation and one missing test. This format models careful economic reasoning: describe, compare, explain, and qualify.

# Configuration catalog

Six basic configurations combine language with one round, ten fixed-market rounds, and ten reassigned markets. Eighteen extended configurations reproduce three DA references and six treatments in each language.

| Configuration                                                                      | Content                                   |
|------------------------------------------------------------------------------------|-------------------------------------------|
| <code>emparejamiento_hospitales_es_1_ronda</code>                                  | Basic DA in Spanish, one round.           |
| <code>emparejamiento_hospitales_es_10_mercado_fijo</code>                          | Basic DA in Spanish, fixed markets.       |
| <code>emparejamiento_hospitales_es_10_mercados_aleatorios</code>                   | Basic DA in Spanish, reassigned markets.  |
| <code>hospital_residents_en_1_round</code>                                         | Basic DA in English, one round.           |
| <code>hospital_residents_en_10_fixed_market</code>                                 | Basic DA in English, fixed markets.       |
| <code>hospital_residents_en_10_random_markets</code>                               | Basic DA in English, reassigned markets.  |
| <code>emparejamiento_hospitales_extendido_referencia_1_ronda</code>                | Extended reference in Spanish, one round. |
| <code>emparejamiento_hospitales_extendido_referencia_10_mercado_fijo</code>        | Extended Spanish reference, fixed market. |
| <code>emparejamiento_hospitales_extendido_referencia_10_mercados_aleatorios</code> | Extended Spanish reference, reassignment. |
| <code>emparejamiento_hospitales_extendido_aceptacion_inmediata</code>              | Immediate acceptance in Spanish.          |
| <code>emparejamiento_hospitales_extendido_da_hospitales</code>                     | Program-proposing DA in Spanish.          |
| <code>emparejamiento_hospitales_extendido_dictadura_serial</code>                  | Serial dictatorship in Spanish.           |
| <code>emparejamiento_hospitales_extendido_listas_truncadas</code>                  | Two-option lists in Spanish.              |
| <code>emparejamiento_hospitales_extendido_capacidades_desiguales</code>            | Quotas 2–1–1–1 in Spanish.                |
| <code>emparejamiento_hospitales_extendido_preferencias_alineadas</code>            | Aligned preferences in Spanish.           |
| <code>hospital_residents_extended_baseline_one_round</code>                        | Extended English reference, one round.    |

| Configuration                                                       | Content                                   |
|---------------------------------------------------------------------|-------------------------------------------|
| <code>hospital_residents_extended_baseline_10_fixed_market</code>   | Extended English reference, fixed market. |
| <code>hospital_residents_extended_baseline_10_random_markets</code> | Extended English reference, reassignment. |
| <code>hospital_residents_extended_immediate_acceptance</code>       | Immediate acceptance in English.          |
| <code>hospital_residents_extended_program_proposing_da</code>       | Program-proposing DA in English.          |
| <code>hospital_residents_extended_serial_dictatorship</code>        | Serial dictatorship in English.           |
| <code>hospital_residents_extended_truncated_lists</code>            | Two-option lists in English.              |
| <code>hospital_residents_extended_unequal_capacities</code>         | Quotas 2–1–1–1 in English.                |
| <code>hospital_residents_extended_aligned_preferences</code>        | Aligned preferences in English.           |

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## Glossary and closing checklist

**Blocking pair:** an applicant and program with a mutually improving deviation. **Capacity:** maximum positions at a program. **Deferred acceptance:** proposals, tentative holds, and rejections. **Immediate acceptance:** step-by-step final allocation. **Priority:** the program's institutional order. **Stable matching:** a matching with no blocking pair. **True rank:** position of the assigned program in the induced order. **Truthful list:** a submission that preserves the induced order.

### Checkpoint

At the end, confirm that every participant sees “Activity completed,” no pending decision remains, denominators correctly refer to applicants or markets, no identifier is projected, and the debrief separates facts, theory, and explanations. Export data only when the course needs it and follow institutional policy.

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