



Instructor guide for job search and the Beveridge curve

Laboratory implementation, theoretical foundations,
experimental evidence, and variants

Behavioral and Experimental Economics Research Lab
Department of Economics



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

How to use this guide

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

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

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

Author

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For the instructor

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

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Purpose and preparation

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.

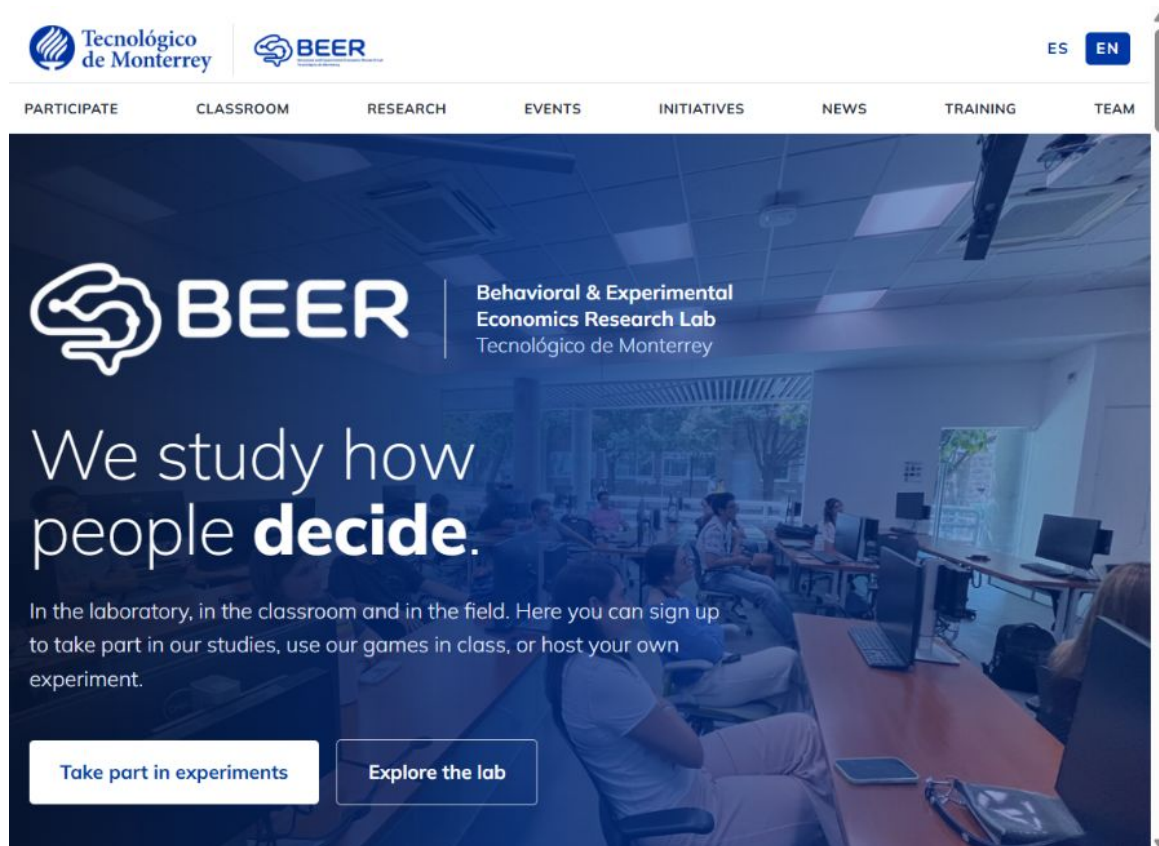


Figure 1.1: Current institutional website. Select CLASSROOM in the top navigation menu to open the teaching experiments. Captured on October 7, 2026.



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.

» empleo — Una interacción
» empleo — Diez períodos, vínculos persistentes
» empleo — Diez encuentros independientes, reasignación
» empleo extendido — Referencia
» empleo extendido — Costo de puesto: 2
» empleo extendido — Costo de puesto: 0,5
» empleo extendido — Producción por empleo: 14
» empleo extendido — Producción por empleo: 8
» empleo extendido — Terminación de empleos: 30%
» empleo extendido — Terminación de empleos: 5%
» empleo extendido — Coeficiente de asignación: 0,9
» empleo extendido — Coeficiente de asignación: 0,3
» empleo extendido — Pago por contratación: 2
» empleo extendido — Búsqueda elegida con costo: 1
» empleo extendido — Propuesta salarial y aceptación
» empleo extendido — Propuesta salarial con límite inferior: 8
» empleo extendido — Producción de 10 a 8 desde período 6

Figure 1.3: Demo contains only the configurations of this game family, in both languages and editions. Continuation 1/2.

— One interaction
— Ten periods, persistent jobs
— Ten independent encounters, reassignment
»xtended — Reference
»xtended — Posting cost: 2
»xtended — Posting cost: 0.5
»xtended — Production per job: 14
»xtended — Production per job: 8
»xtended — Jobs ending: 30%
»xtended — Jobs ending: 5%
»xtended — Assignment coefficient: 0.9
»xtended — Assignment coefficient: 0.3

Búsqueda de empleo y curva de Beveridge / Job Search and the Beveridge Curve — BEER Lab

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

empleo extendido — Coeficiente de asignación: 0.5	
empleo extendido — Pago por contratación: 2	
BE	
empleo extendido — Búsqueda elegida con costo: 1	
empleo extendido — Propuesta salarial y aceptación	
empleo extendido — Propuesta salarial con límite inferior: 8	
empleo extendido — Producción de 10 a 8 desde período 6	
— One interaction	
— Ten periods, persistent jobs	
— Ten independent encounters, reassignment	
extended — Reference	
extended — Posting cost: 2	
extended — Posting cost: 0.5	
extended — Production per job: 14	
extended — Production per job: 8	
extended — Jobs ending: 30%	
extended — Jobs ending: 5%	
extended — Assignment coefficient: 0.9	
extended — Assignment coefficient: 0.3	
extended — Payment per new hire: 2	
extended — Chosen search with cost: 1	
extended — Wage proposals and acceptance	
extended — Wage proposals with lower bound: 8	
extended — Production from 10 to 8 starting in period 6	

Figure 1.4: Demo contains only the configurations of this game family, in both languages and editions. Continuation 2/2.

Rooms

Current rooms:

Búsqueda de empleo · Español
Job search · English
Búsqueda de empleo · Extendido
Job search · Extended

Figure 1.5: Rooms contains the four rooms for this family: basic and extended editions in Spanish and English.

Room: Job search · English

Create a new session

Session Config

[EN] Job search — One interaction

Number of participants

Complete groups of 16 participants. Use a multiple of 16; minimum 16.

Create

[Configure session](#) 

App sequence

search_matching_game (15 rounds)

Bilingual finite-population search, persistent labor links, vacancy posting and instructor feedback.

Figure 1.6: Session-creation form for the basic English room. Check the selected configuration and participant requirement before creating the session.

Downloading a session with several rounds

For the instructor

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

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

1.2 What students can learn

The game makes the coexistence of unemployment and vacancies observable through a sequence of decisions. Four firms choose how many new openings to post, and twelve workers may receive an encounter. Hiring does not emerge from an auction that ranks every offer. It depends on openings, availability for search, and a random procedure that can leave both sides unattended. Once a hire is made, the relationship continues into subsequent periods until a random separation ends it. Current employment therefore contains a history of earlier decisions.

By the end, students should distinguish an opening from a job, an encounter from a hire, and unemployment before matching from unemployment at closing. They should reconstruct an employment transition, calculate aggregate job finding and vacancy filling rates, and identify the

denominator of each rate. A second objective is to explain why a policy that increases hiring need not reduce the resources used by the economy. A hiring payment is a transfer; production depends on employment, while search and posting costs remain costs of the mechanism.

This activity belongs to macroeconomics because it connects decentralized decisions with aggregate stocks and flows. The competitive labor market in the catalog studies hiring and wages through offers and private costs. This family adds persistence, separation, and aggregate matching frictions. The gift exchange game, also available, studies effort and reciprocity after hiring. Here productivity is a parameter and nobody chooses effort. These distinctions should guide curricular selection and prevent the class from attributing a mechanism to this game that it does not contain.

Theoretical foundation

A worker may be willing to work and a firm may have paid to advertise an opening without the two meeting. These simultaneous stocks are not contradictory: matching uses a limited technology and a random assignment procedure.

1.3 Family summary

Purpose	Connect search, vacancies, separations, and unemployment with the Beveridge curve.
Experimental unit	Economy with four firms and twelve workers; economy period and individual decision.
Basic edition	One interaction; ten persistent periods; ten independent encounters with reassignment.
Extended edition	Fifteen-period reference and thirteen parameter or institutional extensions.
Decision	New openings; chosen search and wage proposals with acceptance in specific treatments.
Payoff	Firm: 100 plus production minus wages and posting, plus payment per new hire. Worker: wage or 2 ECU, minus search when applicable.
Participants	Multiples of sixteen; at least thirty-two for reassignment.
Suggested duration	30–40 minutes for one interaction; 45–60 for ten periods; 60–75 for fifteen.
Topics	job search; frictional unemployment; vacancies; job separations; matching; Beveridge curve.
JEL	A22; C92; D83; E24; J63; J64.

Duration includes instructions, comprehension, and discussion rather than decision time alone. Every economy has sixteen human participants. There are no hidden automated workers or decisions imputed by the instructor. The scale makes individual changes visible: one hire represents one twelfth of the labor force. This granularity helps teach conservation of relationships but increases noise in rates. Comparisons across treatments benefit from several independent economies, with lotteries retained in the private export for audit.

The instructor chooses a session configuration; participants do not select a treatment on their screens. Four rooms separate language and edition. There are thirty-four configurations: three basic and fourteen extended per language. The extended reference shares the persistent basic

rules and uses fifteen periods. Each of the thirteen extensions changes a parameter or identifiable sequence. Their number follows usefulness and specification rather than a quota of variants.

1.4 Before opening the session

Prepare an attendance list with a size divisible by sixteen. Sixteen students provide one persistent economy. Reassignment requires at least thirty-two; shuffling the same sixteen people and calling it reassignment across economies does not create that comparison. If students remain outside complete groups, organize observers with a worksheet of hypothetical calculations and explain that their responses do not enter the session. Do not replace an absent participant with the instructor after the activity begins.

Reserve one browser device per participant and a stable connection. Check that everyone can open a page and read numbers before distributing links. Use a separate device for administration and a projection window that does not show individual links. Firms and workers have different forms, so two students seeing different screens does not indicate a failure. Roles are assigned automatically: four firms and twelve workers per economy. In a persistent trajectory, roles and group membership remain constant.

Conceptual preparation can be brief. Ask for everyday definitions of vacancies and unemployment without announcing the pattern you expect to find. Do not present the Beveridge curve before decisions as a target participants should reproduce. Explain that ECU track incentives within the activity and that firms' endowment does not make their earnings comparable to worker earnings. If the course uses monetary conversion, that rule requires an additional approved protocol communicated before decisions.

Checkpoint

Verify language, edition, horizon, participant count, and persistence in the chosen configuration. Check that a basic room offers only the three basic modes in the selected language.

Access and session management

2.1 From the portal to the room

Start at <https://beer-lab.org/> and open the teaching catalog at <https://teaching.beer-lab.org/>. Look for the Job Search and the Beveridge Curve card when the family is incorporated into the catalog. The card offers four language and edition combinations. Canonical routes are reserved for later incorporation; this delivery prepares the implementation and guides without claiming the subdomain has already been deployed.

The Spanish basic room will use this address:

https://laborsearch.beer-lab.org/room/busqueda_empleo_es

The English basic room will use this address:

https://laborsearch.beer-lab.org/room/labor_search_en

Extended rooms share the same subdomain and /room/ prefix. Their names are:

`busqueda_empleo_extendido` (Spanish) and

`labor_search_extended` (English). The instructor panel uses /demo, while the room list uses /rooms. These paths serve different functions: the panel creates sessions and opens reports; a room connects participants; an individual link takes one particular person through their activity.

Local verification uses <http://localhost:8088/demo>. This access works on the computer running the preview. Do not distribute a localhost address to students on other devices because their browsers interpret it as their own machines. Portal screenshots illustrate existing institutional navigation; local screenshots illustrate this family. Before a remote class, coordination must provide an accessible address and verify its four rooms.

2.2 Creating and distributing a session

In Demo select the descriptive name of the mode. One interaction is useful for checking the sequence and studying matching without observed persistence. Ten persistent periods allow jobs to accumulate and separations to be studied. Ten independent reassigned encounters compare responses in reset markets with changing composition. Select the participant count explicitly. Creating a session does not mean a class has begun: start links and administrative access appear first.

Distribute a different link to each student. Never use the same link on two devices or display the link table as a public list from which students choose. The instructor may keep a private correspondence for troubleshooting, but that table must not accompany projected aggregates. The monitor shows who has reached a page, while the report interprets economic outcomes from completed periods. A person waiting may have correctly completed their task and be waiting for

others in their economy.

In a room, verify the selected session and communicate entry according to the institutional protocol. Rooms do not remove the need to control participant counts and links. At closing, save data before preparing another class. Resetting or replacing the database may invalidate old links; create a new session for a new activity. Do not reuse a completed session as though its forms were blank worksheets.

For the instructor

If another family appears in Demo or the rooms, pause the start and consult coordination. This family should show only hiring activities, Spanish and English, and basic and extended editions.

Create session

Tip: consider creating your session in a [Room](#), for more stable start links that are not opened accidentally.

Session Config

[ES] Búsqueda de empleo — Una interacción

Number of participants

16

Must be a multiple of 16

Create

[Configure session](#) 

App sequence

search_matching_game (15 rounds)

Bilingual finite-population search, persistent labor links, vacancy posting and instructor feedback.

Figure 2.1: Creating an economy with sixteen participants.

2.3 The opening screens

The welcome screen displays institutional logos, a short laboratory introduction, and common rules. Each participant must accept individual decision making, silence, and private requests for assistance. These rules restrict unplanned communication; they do not prevent the instructor from explaining a word or resolving a technical issue. Assistance should concern procedure and should not suggest how many openings to post, whether to search, or which wage to accept.

The instructions identify role and horizon, present the sequence, and show parameters. Everyone

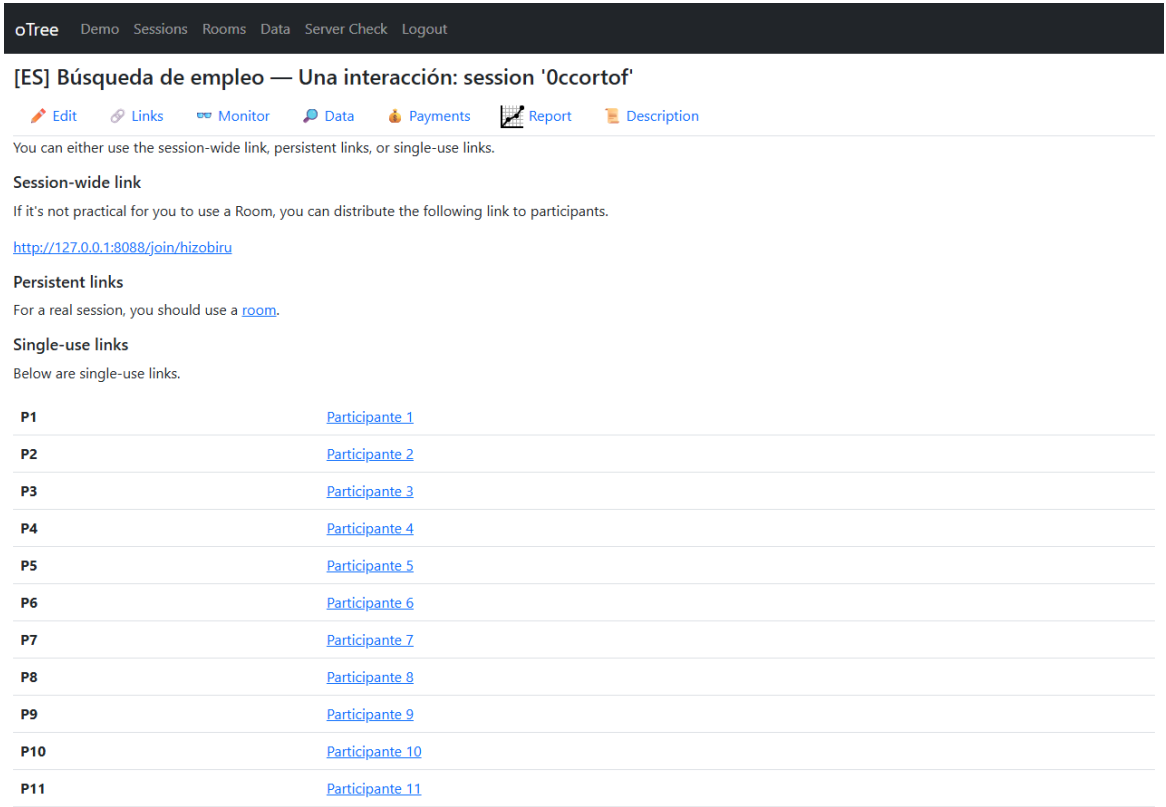


Figure 2.2: Individual links; labels are anonymized in this guide.

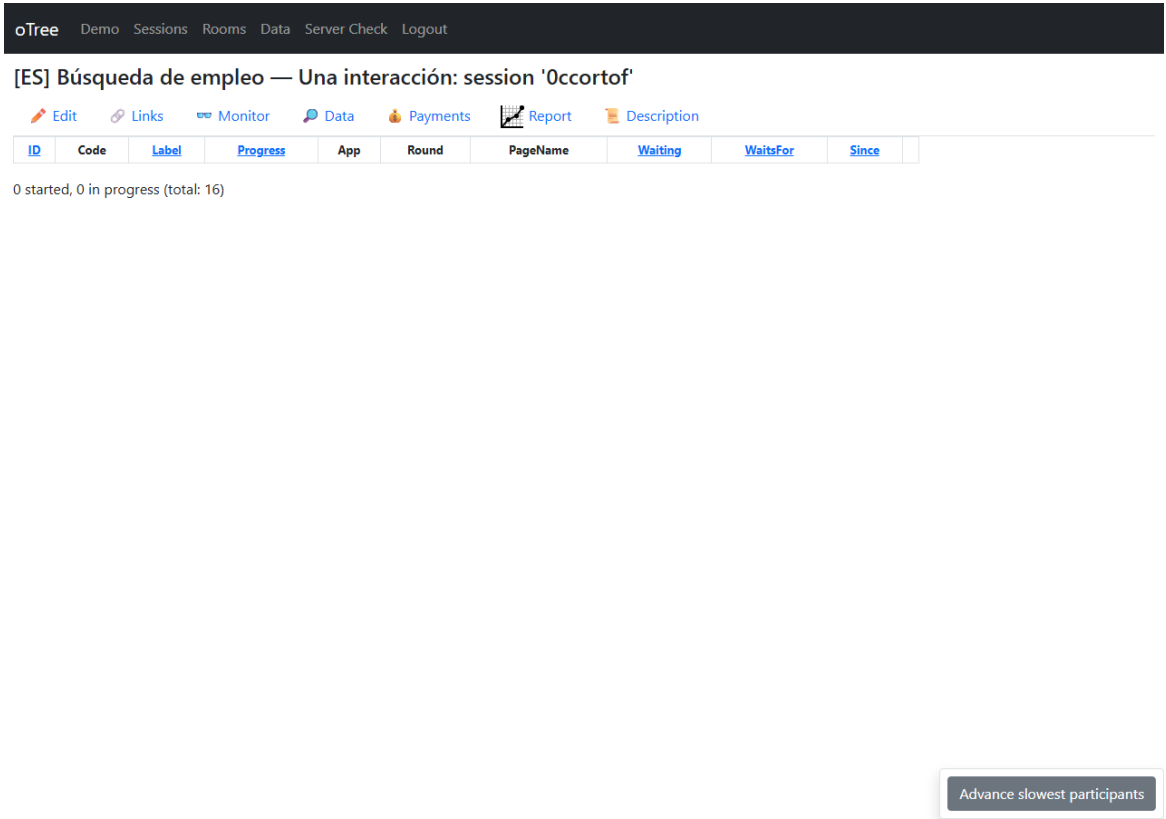


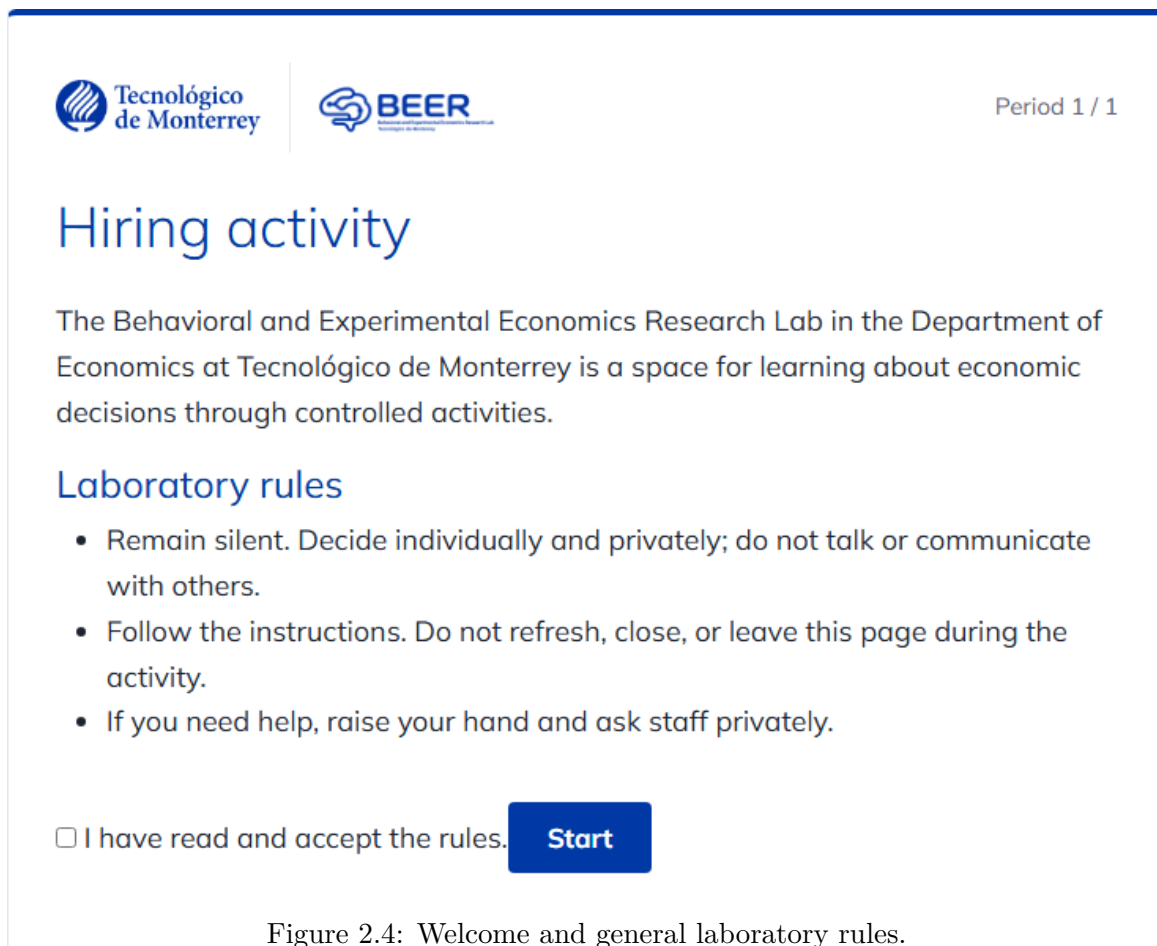
Figure 2.3: Administrative monitor with identifiers concealed for the screenshot.

can read both roles' rules although they make only their own decisions. Showing incentives prevents the class from inventing objectives after seeing results. The numerical example uses basic values and is explicitly identified as an example; actual parameters appear on the same screen. In an extension, point out that distinction when someone tries to apply the example mechanically.

The comprehension check asks whether an unfilled opening incurs its cost, what posting guarantees, and how a retained job continues. Correct answers are yes, a chance of an encounter, and continuation at the agreed wage. A wrong response produces an instruction to review the rules. Do not interpret the number of mistakes as an economic trait of the person: it may reflect reading, vocabulary, or distraction. Use the check to establish understanding before measuring decisions.

What participants will see

Participants see rules and consequences of actions. Their screens do not announce hypotheses, theory labels, or internal production identifiers. Economic interpretation is reserved for the later discussion.



The screenshot shows a web interface for the BEER Lab. At the top left are the logos for 'Tecnológico de Monterrey' and 'BEER'. At the top right, it says 'Period 1 / 1'. The main heading is 'Hiring activity'. Below this is a paragraph: '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.' This is followed by a section titled 'Laboratory rules' with three bullet points: 'Remain silent. Decide individually and privately; do not talk or communicate with others.', 'Follow the instructions. Do not refresh, close, or leave this page during the activity.', and 'If you need help, raise your hand and ask staff privately.' At the bottom, there is a checkbox labeled 'I have read and accept the rules.' and a blue 'Start' button.

Figure 2.4: Welcome and general laboratory rules.

2.4 Decisions and individual closing

At the start of a period, separations are drawn once and recorded. Firms observe retained jobs and the number of workers unemployed before search. They then choose an integer between zero and three new openings. The form also reminds them of posting cost, productivity, and any additional hiring payment. Other firms' simultaneous responses are not shown. Posting zero is valid and is different from leaving the form blank.



Period 1 / 1

Instructions

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.

Your role: Firm · Active periods: 1

First, jobs ending this period are determined. Firms then choose new openings and unemployed workers are available to search. The program assigns encounters and finally settles earnings.

The same four firms and twelve workers remain in the economy. An accepted job continues into the next period unless it ends by lottery.

Each firm posts between 0 and 3 new openings. It pays for every posted opening, even if unfilled. Retained jobs do not incur that posting cost again.

Let S be the number of available job seekers and V the total new openings. Expected encounters are $\min(S, V, \eta \times \sqrt{S \times V})$. The integer part is taken and one encounter is added with probability equal to the fractional part. Workers and openings are assigned randomly without duplication. An encounter may fail to occur even when openings exist.

New jobs pay 6 ECU per period and are accepted automatically.

All unemployed workers automatically participate in search at no cost. Workers with retained jobs do not search for another opening.

Cost per posted opening	1.00 ECU
Production per job	10.00 ECU
Probability each job ends	10.00%
Assignment coefficient η	0.60
Additional payment per new hire	0.00 ECU
Search cost	0.00 ECU

Firm: $100 + \text{productivity} \times \text{final employment} - \text{wages paid} - \text{cost} \times \text{posted openings} + \text{payment per new hire}$.

Worker: wage when employed; 2 ECU when unemployed; minus search cost when applicable.

All earnings are expressed in ECU and are added across the activity. Roles have different payoff rules; their totals do not provide a common performance ranking.

Figure 2.5: Current instructions for the basic edition. Initial resources, decision rules, and experimental units. Continuation 1/2.

First, jobs ending this period are determined. Firms then choose new openings and unemployed workers are available to search. The program assigns encounters and finally settles earnings.

The same four firms and twelve workers remain in the economy. An accepted job continues into the next period unless it ends by lottery.

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Worker: wage when employed; 2 ECU when unemployed; minus search cost when applicable.

All earnings are expressed in ECU and are added across the activity. Roles have different payoff rules; their totals do not provide a common performance ranking.

Calculation example

With 12 job seekers, 4 openings and $\eta = 0.6$, expected encounters are 4. A firm with 2 jobs at wage 6 and one posted opening, productivity 10, posting cost 1 and no additional hiring payment earns 107 ECU. A worker with wage 6 earns 6 ECU; an unemployed worker earns 2 ECU.

[Continue](#)

Figure 2.6: Current instructions for the basic edition: initial resources, decision rules, and experimental units. Continuation 2/2.

Cost per posted opening	1.00 ECU
Production per job	10.00 ECU
Probability each job ends	10.00%
Assignment coefficient η	0.60
Additional payment per new hire	0.00 ECU
Search cost	0.00 ECU

Firm: $100 + \text{productivity} \times \text{final employment} - \text{wages paid} - \text{cost} \times \text{posted openings} + \text{payment per new hire}$.

Worker: wage when employed; 2 ECU when unemployed; minus search cost when applicable.

All earnings are expressed in ECU and are added across the activity. Roles have different payoff rules; their totals do not provide a common performance ranking.

Figure 2.7: Parameters and earnings rules.

Calculation example

With 12 job seekers, 4 openings and $\eta = 0.6$, expected encounters are 4. A firm with 2 jobs at wage 6 and one posted opening, productivity 10, posting cost 1 and no additional hiring payment earns 107 ECU. A worker with wage 6 earns 6 ECU; an unemployed worker earns 2 ECU.

Figure 2.8: Numerical example using basic parameters.



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



Period 1 / 1

Check the rules

Is the cost paid for an unfilled posted opening?

Your answer: No. The correct answer is Yes. Review your answers against the instructions.

What does posting openings guarantee?

In a persistent economy, what happens to a retained job?

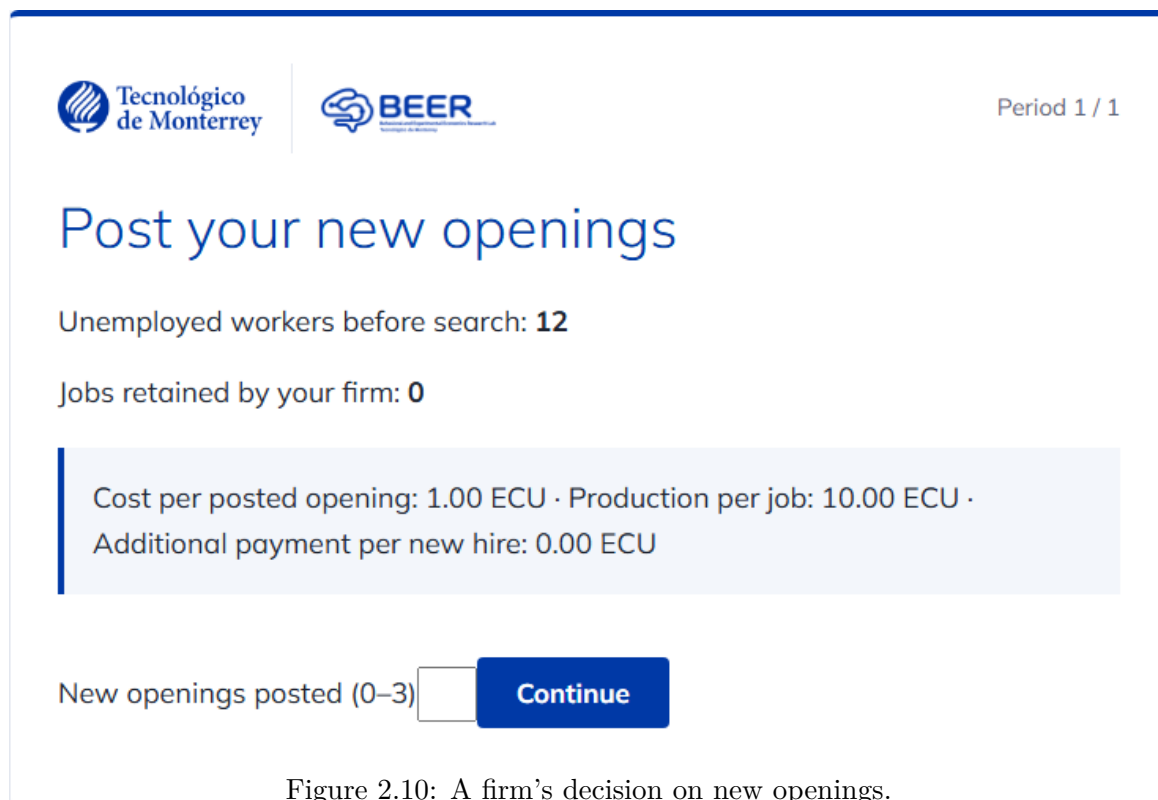
Continue

Powered by [oTree](#)

Figure 2.9: Current comprehension check with an incorrect answer, its specific explanation, and retained responses.

A worker sees either a retained job and its wage or availability for search. In the reference, every unemployed worker automatically searches and continuing acknowledges reading. In the chosen search extension, the form offers search or no search and announces the cost. Those with retained jobs cannot search for an additional job. In wage extensions, a worker who receives an encounter sees a proposal and chooses acceptance or rejection. That page appears only when an actual proposal exists.

Neutral wait pages synchronize the beginning, assignment, and settlement. They reveal neither who is delayed nor what anyone chose. Results show individual and cumulative earnings along with economy flows. Firms see employment, new hires, and wage bills; workers see employment status and observed duration when they remain unemployed. The final screen confirms responses have been recorded and offers no button leading into inactive technical rounds.



The screenshot displays the BEER Lab interface for a firm's decision on new openings. At the top left, the logos for "Tecnológico de Monterrey" and "BEER" are visible. The top right corner indicates "Period 1 / 1". The main heading is "Post your new openings". Below this, the text states "Unemployed workers before search: 12" and "Jobs retained by your firm: 0". A light blue box contains the following information: "Cost per posted opening: 1.00 ECU · Production per job: 10.00 ECU · Additional payment per new hire: 0.00 ECU". At the bottom, there is a label "New openings posted (0–3)" followed by a text input field and a blue "Continue" button.

Tecnológico de Monterrey | BEER

Period 1 / 1

Post your new openings

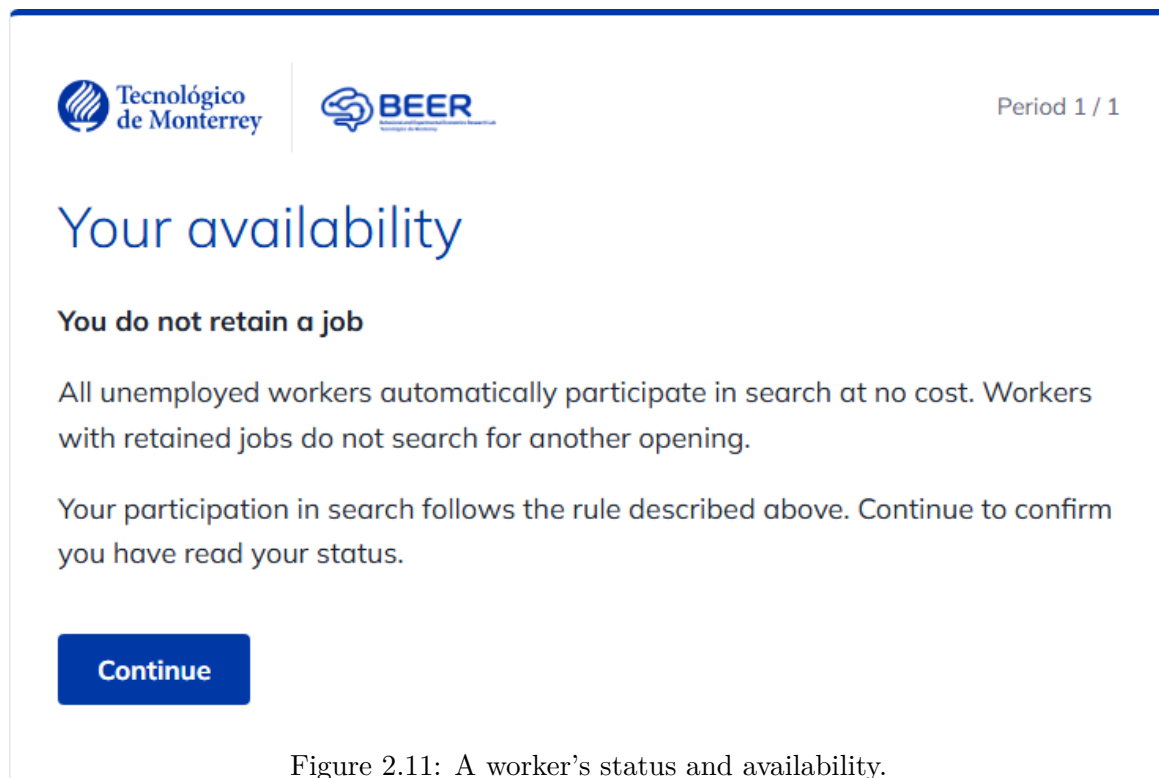
Unemployed workers before search: **12**

Jobs retained by your firm: **0**

Cost per posted opening: 1.00 ECU · Production per job: 10.00 ECU ·
Additional payment per new hire: 0.00 ECU

New openings posted (0–3) [Continue](#)

Figure 2.10: A firm's decision on new openings.



The screenshot shows a web interface for the BEER Lab. At the top left, there are two logos: 'Tecnológico de Monterrey' and 'BEER'. At the top right, it says 'Period 1 / 1'. The main heading is 'Your availability'. Below this, there is a section titled 'You do not retain a job'. The text explains that all unemployed workers automatically participate in search at no cost, while workers with retained jobs do not search for another opening. It also states that participation follows the rule described above and asks the user to continue to confirm they have read their status. A blue 'Continue' button is located at the bottom left of the content area.

Tecnológico de Monterrey

BEER

Period 1 / 1

Your availability

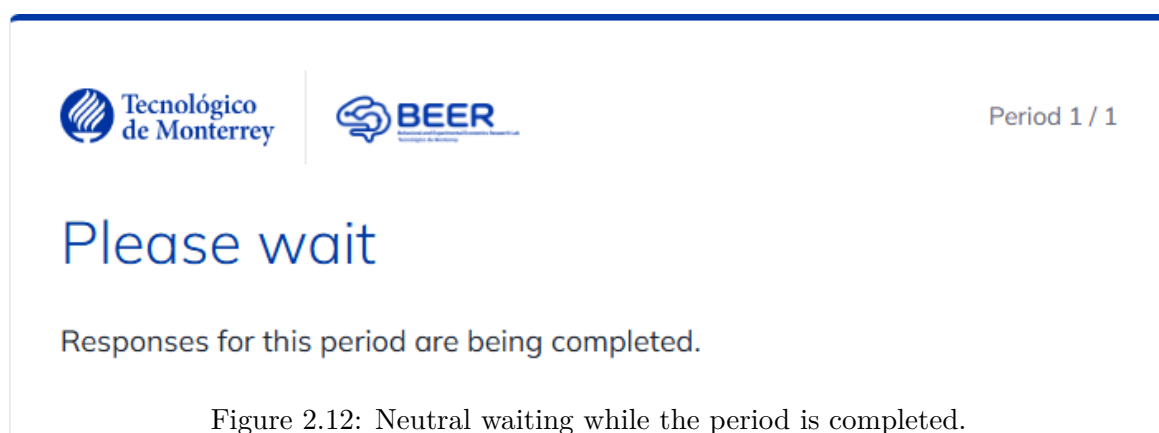
You do not retain a job

All unemployed workers automatically participate in search at no cost. Workers with retained jobs do not search for another opening.

Your participation in search follows the rule described above. Continue to confirm you have read your status.

[Continue](#)

Figure 2.11: A worker's status and availability.



The screenshot shows a web interface for the BEER Lab. At the top left, there are two logos: 'Tecnológico de Monterrey' and 'BEER'. At the top right, it says 'Period 1 / 1'. The main heading is 'Please wait'. Below this, the text states 'Responses for this period are being completed.'.

Tecnológico de Monterrey

BEER

Period 1 / 1

Please wait

Responses for this period are being completed.

Figure 2.12: Neutral waiting while the period is completed.

Your earnings this period		Cumulative earnings	
101.00 ECU		101.00 ECU	
New openings posted		3	
Final employment		1	
New hires		1	
Wages paid		6.00 ECU	
Economies			
Unemployed workers before search		12	
Job seekers		12	
New openings posted		12	
Assigned encounters		7	
New hires		7	
Jobs that ended		0	
The result includes lotteries. No particular response guarantees a job.			

Figure 2.13: Individual settlement and economy flows for a firm.

Your earnings this period 2.00 ECU	Cumulative earnings 2.00 ECU
--	--

Your closing status: **Unemployed**

Consecutive unemployed periods at closing: 1

Economies

Unemployed workers before search	12
Job seekers	12
New openings posted	12
Assigned encounters	7
New hires	7
Jobs that ended	0

The result includes lotteries. No particular response guarantees a job.

Figure 2.14: Worker employment status and earnings.



Period 1 / 1

Activity complete

Cumulative earnings: **101.00 ECU**

Your responses have been recorded. Remain silent and wait for staff instructions.

Figure 2.15: Final confirmation of the activity.

The mechanism and its predictions

3.1 Stocks, flows, and measurement timing

A vacancy is an opening posted during the period. Employment is an effective relationship with a worker. A firm's workforce may exceed its three permitted new openings because it retains jobs created earlier. Vacancies expire at the end of the period: an unfilled opening does not automatically carry into the next one. Consequently, past openings must not be added to measure current supply, and posting costs must not be charged to the whole workforce.

Let $L = 12$ denote an economy's labor force, E_{t-1} employment at the previous closing, and D_t current separations. Retained employment is $E_{t-1} - D_t$, and unemployment before search is $U_t = L - E_{t-1} + D_t$. If H_t denotes accepted hires, closing satisfies

$$E_t = E_{t-1} - D_t + H_t, \quad U_t^{\text{closing}} = U_t - H_t.$$

These identities audit a session without revealing anyone's identity. Initially everyone is unemployed: $E_0 = 0$, $U_1 = 12$, and $D_1 = 0$. Independent encounters repeat that initial condition each time. They do not provide a labor transition comparable with a persistent trajectory.

The report constructs Beveridge points using $u_t = U_t/12$ and $v_t = V_t/12$, both before matching. Vacancies exclude retained jobs. Unemployment includes everyone without a job, including those who subsequently choose not to search in the voluntary extension. The job finding rate instead uses actual searchers, rather than all unemployed workers. Keeping the definitions distinct prevents confusion between a stock of people without jobs and the population exposed to assignment.

A decrease in closing unemployment alongside many current openings may reflect hires made in that very period. Combining later unemployment with earlier vacancies changes the statistical question. The program provides both unemployment rates in the period table but identifies the graph's timing. Ask students to explain that measurement choice before interpreting any slope.

3.2 The encounter technology

Firms post $v_{jt} \in \{0, 1, 2, 3\}$ openings and the total is $V_t = \sum_j v_{jt}$. The number of searchers is $S_t \leq U_t$. In the reference $S_t = U_t$. Expected encounters are determined by

$$\mu_t = \min\{S_t, V_t, \eta\sqrt{S_t V_t}\}, \quad \eta = 0.6.$$

The function increases with both inputs but never promises more encounters than available people or openings. If either input is zero, no encounters occur. Excess vacancies may increase costs without increasing the number of people who can be hired. Excess searchers may leave unemployment even when every opening is filled.

Realized encounters M_t equal the integer part of μ_t , plus one with probability given by the fractional part. If $\mu_t = 3.4$, three encounters occur with probability 0.6 and four with probability 0.4. The expectation is 3.4, although no session can hire four tenths of a person. When the expectation is integer, encounter count is deterministic but the identities of workers and openings remain random. Each worker appears at most once, as does each opening.

The program uniformly selects eligible workers and openings. A firm posting two openings has two entries in selection; it does not necessarily receive two workers. Probabilities depend on posted openings rather than productivity, personal sympathy, or instructor responses. Separation lotteries are independent of posting decisions and apply to every existing relationship. Realizations are recorded and are not redrawn when a page reloads.

The parameter η represents aggregate matching efficiency rather than individual effort. In the chosen search extension, not searching reduces S_t without directly changing η . In wage extensions, an encounter produces a proposal rather than necessarily a hire: $H_t \leq M_t$. Keeping these margins separate allows the class to ask whether an opening remained unfilled because of a missing encounter or a rejected proposal.

3.3 Earnings, production, and resources

With productivity p_t , posting cost c , contractual wage w_i , and additional payment a per new hire, a firm earns

$$\Pi_{jt} = 100 + p_t n_{jt} - \sum_{i \in j} w_i - c v_{jt} + a h_{jt}.$$

The wage sum covers all closing employees, including earlier hires. The additional payment covers only newly accepted hires. Posting cost covers all advertised openings, even when unfilled. The endowment of 100 is credited each period to keep earnings easy to interpret; it is neither production nor a gain caused by hiring.

A worker receives the contractual wage when employed at closing and the benefit of 2 when unemployed. In the voluntary extension, a cost of 1 is deducted when a worker without a retained job chose to search, even if subsequently hired. A worker retaining a job pays no search cost. For example, someone who searched and accepted wage 6 earns 5 that period; if the job survives into the next period, earnings are 6. The difference records a one-time cost rather than a change in contractual wage.

Aggregate production equals $p_t E_t$. Wages transfer income between firms and workers; they do not create additional production. Benefits and hiring payments are public transfers recorded separately. The program does not finance them through participant taxes or model fiscal constraints. Explain that simplification in the welfare discussion: comparing total ECU alone can confuse endowments and transfers with real resources.

For a surplus exercise, subtract posting and search costs from production while excluding endowments and transfers. If you assign a value to time without employment, state it as an additional assumption because this version does not include leisure utility. Proposed wages change distribution and incentives for acceptance and posting but do not directly change productivity. A high wage may preserve acceptance while reducing the firm's margin.

Attention

Do not compare firm earnings with worker earnings to declare who made better decisions. Roles, endowments, and opportunities differ. Compare behavior within roles and reconstruct the payoff rules.

3.4 The horizon and the value of hiring

In one interaction, a firm considers a hire's current margin and advertising cost. In a persistent trajectory, an early hire may generate margins for several periods without paying posting costs again. With fixed wage 6 and productivity 10, each active job contributes 4 ECU per period. If K periods remain including the current one and separation probability is s , the expected margin of a new job, conditional on obtaining it, is

$$J_K = 4 \sum_{k=0}^{K-1} (1-s)^k.$$

This calculation assumes constant parameters, automatic acceptance, and no additional discounting. It excludes the cost of obtaining an encounter, paid before assignment becomes known. It also does not solve the equilibrium interaction among four firms.

With two periods remaining and $s = 0.1$, expected value is $4(1 + 0.9) = 7.6$. In the last period it is 4. Early hiring can be attractive because more future flows remain, whereas more frequent separation reduces expected duration. A finite horizon creates a terminal effect: late decisions cannot automatically be compared with an indefinitely lasting economy. The guide uses this feature to separate flows, stocks, and expected values.

A vacancy's filling probability depends on other firms' postings and on worker search. Additional openings may lower probability per opening by congesting the same pool of workers. A firm privately benefits from a hire but may displace another firm's chance of hiring. Marginal calculation must consider an additional opening's cost and its expected increase in hires, rather than mechanically multiplying all postings by the economy's average filling rate as though that rate were fixed.

Independent encounters do not carry this persistence value, although decisions repeat ten times. Each closing resets and no jobs survive. Reassignment also changes rival firms and worker composition. Consequently, the mode does not isolate reputation or partner effects: it compares a package of reset and composition changes. A causal comparison of persistence with constant membership would require another specific configuration and appropriate experimental assignment.

3.5 A stationary Beveridge reference

The Beveridge curve describes an inverse unemployment-vacancy relationship consistent with balanced flows into and out of employment. To derive a classroom reference, assume automatic acceptance, search by all unemployed workers, constant parameters, and lotteries replaced by expectations. Also assume the worker and opening bounds do not constrain the square-root term. These are not conditions that every actual classroom period must satisfy.

In a stationary state, hires offset separations: $M = sE$. Because U is measured after separation and before hiring, retained employment satisfies $L - U = (1 - s)E$. Therefore

$$\eta\sqrt{UV} = \frac{s(L - U)}{1 - s}.$$

With $u = U/L$ and $v = V/L$, the interior reference is

$$v = \frac{s^2}{\eta^2(1 - s)^2} \frac{(1 - u)^2}{u}.$$

For $0 < u < 1$, it decreases as u increases. Higher efficiency reduces openings required to sustain the same unemployment; higher separation increases them. This reference uses the game's measurement timing. A formula based on closing unemployment requires a different derivation.

The cap of three postings per firm limits V to twelve. Small population size and randomized rounding prevent every continuous value in the expression from being realized. Firms also choose postings and the economy may be far from stationarity. Do not present this expression as an exact prediction for each observed point. Use it to examine flow balances and comparisons that hold the other assumptions constant.

A change in posting cost or firm margin may alter chosen vacancies within an unchanged technology. A change in efficiency or separation also changes the flow relationship sustaining the reference. With adjustment underway, a handful of points cannot reliably distinguish movement from shifts by appearance alone. Ask for an explanation based on which parameter changed, then examine evidence. The report's descriptive plot does not impose a slope or estimate a causal curve.

3.6 Research and classroom adaptation

Duffy and Jenkins (2024) experimentally study vacancy posting in a search-and-matching model. They compare changes in posting costs, surplus per employee, and separation, reporting evidence of an inverse unemployment-vacancy relationship. Their design uses ten human firms, a modeled workforce of 120, probabilistic continuation, and parameters different from ours. The article supports the mechanism and those comparisons; it does not validate the values or behavior of this adaptation.

The classroom version uses four firms and twelve human workers, finite horizons of one, ten, or fifteen periods, basic wage 6, productivity 10, posting cost 1, separation 0.1, and efficiency 0.6. This scale exposes each role's experience and records proposal acceptance when relevant. Finite continuation makes class planning feasible. Both choices change the problem: the activity must not be presented as an exact replication, and published equilibrium values must not be transferred into our parameterization.

Posting cost, margin, and separation extensions relate directly to the article's comparisons. Efficiency changes, hiring payments, and chosen search are pedagogical adaptations of the mechanism. Wage proposals are offers that can be accepted or rejected; they implement neither Nash bargaining nor successive counteroffers. The wage bound is added only to that endogenous sequence. The source grounds the core; additional protocols are defined by their explicit rules.

Predictions assume understanding and maximization of expected income. Deviations may reflect risk, fairness, learning, or mistakes; rejecting an offer alone does not identify a motivation. Records describe behavior, but distinguishing explanations requires variation and additional measures. Missing results must not be filled with theoretical predictions.

Modes and extensions

4.1 Choosing an interpretable comparison

The basic one-interaction mode retains the full rules but provides no employment history. Use it to explain sunk posting costs, randomness, and the difference between earnings and production. Ten persistent periods add accumulation of relationships and the value of an early hire. Ten reassigned encounters reset the economy, preserve roles, and redistribute firms and workers across groups. Comparison with persistence must acknowledge both reset and composition changes.

To study an extension, use another fifteen-period fixed-group session with basic parameters as its reference. Keep language, size, horizon, and common instructions constant. Comparing ten with fifteen periods confounds treatment with horizon; comparing students already familiar with the game with new students confounds treatment with experience. If the same class plays two configurations, record order and explain that the second run is not independent. Alternating orders across economies can improve the exercise but does not remove every learning difference.

The extended reference and thirteen extensions are available in both languages. All parameters are announced before decisions. There are no secret changes or penalties added during a session. Earnings accumulate within a session and do not transfer to another. Productivity changing from period six is a known schedule, distinct from comparing two sessions with constant productivity. Select a small set of comparisons for a class; having many options does not require running them all within one hour.

4.2 Higher and lower posting costs

These two configurations set posting cost at 2 or 0.5, compared with 1 in the reference. The question is how investment in hiring opportunities changes when advertising becomes more or less costly. Productivity, wage, separation, and efficiency retain their basic values. The sequence is unchanged: firms post, the program assigns, and accepted jobs produce. Every opening incurs the selected cost even when unfilled; retained employment does not pay again.

Standard reasoning predicts that higher cost discourages posting, other conditions held constant. However, a firm might post more if rivals reduce openings and its hiring probability increases. An equilibrium prediction must consider interaction, the three-opening cap, and horizon. Examine the distribution of firm postings, total vacancies, and hires rather than earnings alone, because cost changes earnings mechanically even with identical behavior.

The cost comparison directly follows the vacancy posting problem examined by Duffy and Jenkins, with classroom-adapted magnitudes. Low cost adds a symmetric comparison useful for saturation. If almost every firm chooses three, the cap may conceal further responses. Ask what that bunching

means and avoid concluding that unchanged decisions reveal indifference to costs. A firm with two employees at wage 6 and one posting would earn 106 at cost 2 and 107.5 at cost 0.5, without changing production.

4.3 Higher and lower productivity

Production per job is 14 in one configuration and 8 in the other, compared with 10. The basic wage stays at 6, so margin per job changes from 4 to 8 or 2. This changes current returns and the value of keeping a relationship without changing mechanical encounter probabilities for given quantities. The teaching question separates firm incentives from matching technology.

Theory suggests that higher margins make posting attractive, although congestion, caps, and horizon may moderate responses. Read openings and new hires first, then employment and production. Production can increase through productivity even if employment does not rise. Decompose pE into its two factors before attributing all change to hiring. Workers in both configurations continue receiving 6 per job; no implicit wage negotiation is introduced.

These variants adapt the article's firm-surplus comparison. Lower productivity adds a contraction of the margin. Groups remain fixed and parameters constant for fifteen periods. When comparing firm earnings, separate the mechanical margin change from posting and employment responses. Higher earnings do not establish greater search efficiency: efficiency remains 0.6. Ask what would happen if wages also increased, while making clear that this is a counterfactual rather than an implemented rule in these variants.

4.4 More and less frequent separation

Each relationship's termination probability becomes 0.30 or 0.05, compared with 0.10. Separation is drawn at the beginning, and a separated worker can search immediately that period. It is not a firm-chosen dismissal and does not depend on wages, tenure, or cumulative earnings. Firms cannot prevent the lottery by posting more or fewer openings. Information after the lottery lets them respond to actually retained employment.

Higher separation reduces expected relationship duration and increases inflows to unemployment. It may lower hiring value but also creates more available workers and opportunities to fill openings. Posting predictions should not follow from only one of those forces. Separation comparison directly follows the reference experiment; specific values and human workers are adaptations.

Examine separations, new hires, retained employment, and closing unemployment. Many hires may reflect replacement rather than a market that avoids unemployment. Use the appropriate exposed population: separation probability applies to jobs existing before the lottery, not the entire labor force. Small groups may experience no separations despite positive probability. Do not alter outcomes to make a treatment visible; explain probability versus realization and use replications. Lower unemployment under infrequent separation may coexist with fewer new hires because fewer relationships need replacement.

4.5 Higher and lower matching efficiency

These configurations set η to 0.9 or 0.3 while holding other parameters constant. The question is whether a better technology connecting people and openings can sustain employment with less posting expenditure. For given quantities, expected encounters increase with efficiency until the

worker or opening bound is reached. Once that bound applies, higher efficiency cannot create additional workers or openings.

The mechanical prediction is clear with S and V held constant. Equilibrium response differs because firms may adjust postings. Greater efficiency might allow needs to be filled with fewer openings; it might also increase postings by raising expected returns. Separate behavioral adjustment from the direct coefficient effect. This guide treats efficiency as an adaptation of the matching function rather than replication of a specific empirical treatment in the cited article.

The report compares job finding and filling rates along with unemployment-vacancy pairs. Do not identify the coefficient with searcher effort, which belongs to another extension. Fewer vacancies can yield fewer total encounters despite higher efficiency. For a controlled exercise, calculate expected encounters with identical quantities and three coefficient values. With nine searchers and four openings, expectations are 1.8, 3.6, and 4 for coefficients 0.3, 0.6, and 0.9. The last result illustrates the four-opening bound.

4.6 Payment per new hire

Firms receive 2 extra ECU for each newly accepted hire. Payment occurs in the hiring period rather than every surviving period, and an unfilled advertised opening receives nothing. The comparison distinguishes rewarding actual hiring from making every advertisement cheaper. They are different instruments: one conditions a transfer on an outcome, while the other reduces cost even without an encounter.

Basic sequence and wages remain unchanged. Earnings include $2h_{jt}$, and public expenditure adds 2 per new hire to unemployment benefits. Standard reasoning predicts increased expected value of obtaining a worker; posting response depends on other firms and market state. Compare vacancies, hires, and public expenditure without presenting total transfers as additional production. An economy where almost everyone is employed has little room for new hires despite attractive transfers.

This is a pedagogical adaptation of job creation. It does not replicate evaluation of a real program or model taxes, historical eligibility, or fraud. In a policy debrief, ask which hires appear additional relative to a comparable reference and which would have occurred anyway. The latter quantity is counterfactual and cannot be identified from beneficiaries alone. Posting limits and lotteries make conclusions from a single economy particularly weak. The extension separates fiscal cost, private incentives, and employment change rather than estimating cost per additional job.

4.7 Chosen search and participation cost

A worker without retained employment chooses whether to search. Searching costs 1 ECU that period regardless of success. Not searching preserves earnings of 2 and excludes the worker from assignment. Retained workers make no search decision and pay no cost. The question concerns participation changing the effective matching input without changing initial unemployment stock.

With hiring probability f and wage 6, current expected earnings from search are $f \times 6 + (1 - f) \times 2 - 1 = 1 + 4f$. Not searching yields 2, so with one period remaining, a risk-neutral worker prefers search when $f > 0.25$. Persistence adds future employment benefits, and the current threshold does not solve the entire decision. Probability depends on simultaneous postings and other searchers rather than a number guaranteed by the program.

This adaptation adds participation supply to a firm-centered core. The new page announces cost before choice, and the report uses actual searchers in the hiring denominator. Compare U with S ,

hires, and unemployment duration. If search falls, the finding rate may rise through selection or reduced congestion even when total hires decrease. A higher rate does not automatically mean more people obtain work. Discuss risk and strategic uncertainty without labeling nonsearchers lazy.

The screenshot shows a web interface for a labor market experiment. At the top, there are logos for 'Tecnológico de Monterrey' and 'BEER'. The title 'Your availability' is prominently displayed. Below it, a bold heading states 'You do not retain a job'. The main text explains the choice: 'If you do not retain a job, choose whether to search. Searching costs 1 ECU even when no job is obtained. Not searching excludes you from the current assignment and leaves earnings of 2 ECU.' Two radio buttons are provided: 'Search this period' and 'Do not search this period'. A paragraph follows: 'Your participation in search follows the rule described above. Continue to confirm you have read your status.' At the bottom, there is a blue 'Continue' button.

Figure 4.1: Explicit search choice with announced cost.

4.8 Wage proposals and acceptance

Firms propose an integer wage between 2 and 10 for all new openings. Quantity and wage are submitted simultaneously. After matching, each worker receiving a proposal accepts or rejects. Rejection preserves unemployment and benefit 2, with no further encounter that period. Acceptance fixes the wage while the relationship survives; subsequent proposals do not change retained contracts. There is no counteroffer or later bargaining.

The extension introduces surplus distribution and acceptance into a frictional market. With one period remaining and exclusively monetary motivation, wages above 2 dominate rejection; wage 2 gives current indifference. Over several periods, continuation value and possible future encounters matter. Responses can also reflect fairness, risk, or learning. Do not attribute every rejection to one motivation or call this protocol Nash bargaining.

Posting costs remain payable for rejected proposals, and rejection does not redraw assignment. The encounter counts in M but not hires H . Report and export separate them. Compare proposed wages, acceptance, and openings alongside employment. The private export records contractual wages and proposals; the projected report shows no identities or individual relationships. This is an explicit institutional adaptation grounded in surplus allocation through offers and acceptance, rather than a specific result from the vacancy experiment.

Period 1 / 15

Post your new openings

Unemployed workers before search: **12**

Jobs retained by your firm: **0**

Cost per posted opening: 1.00 ECU · Production per job: 10.00 ECU ·
Additional payment per new hire: 0.00 ECU

New openings posted (0–3) Integer wage for new openings (2–10 ECU)

Continue

Figure 4.2: Quantity and common wage for new proposals.

Period 1 / 15

You have a job proposal

Wage: **6.00 ECU**

This wage is paid each period you retain this job. Rejection does not give you a second encounter this period.

☐ Accept the job ☐ Reject the job **Continue**

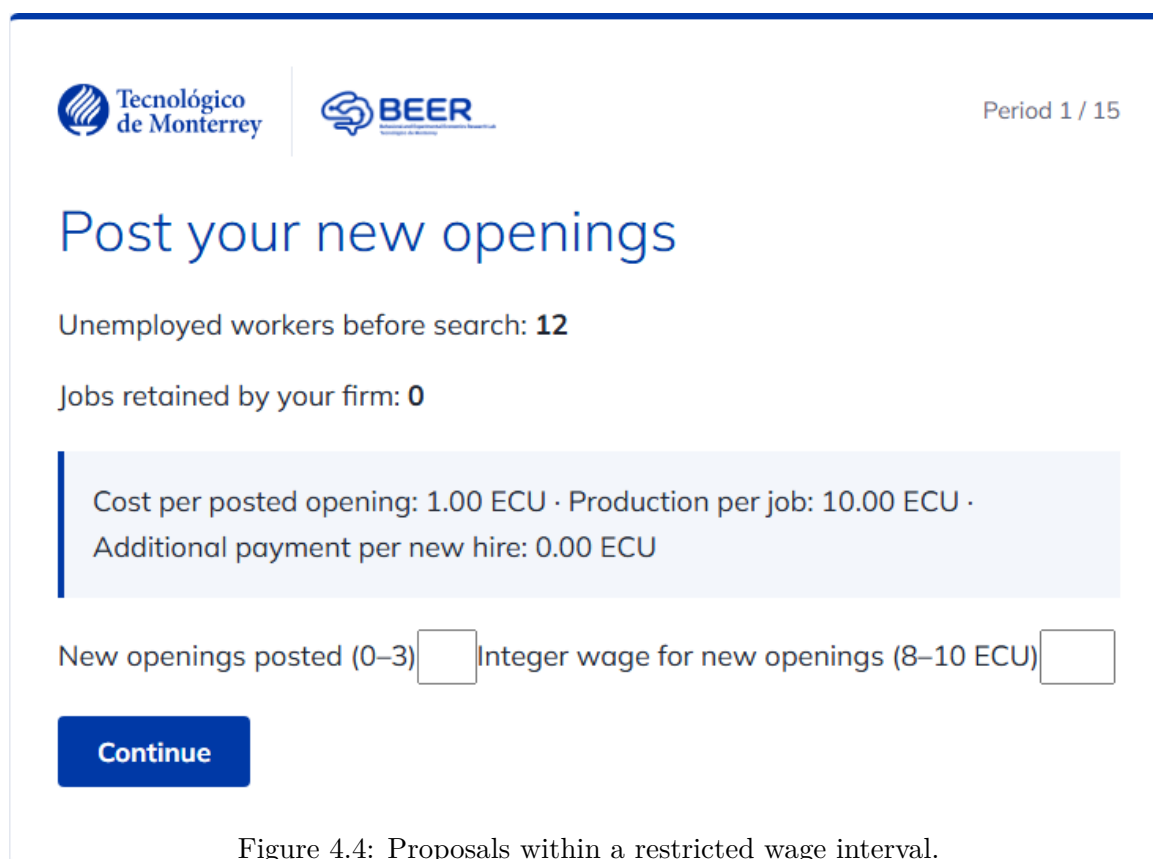
Figure 4.3: Accepting or rejecting an actual proposal.

4.9 A wage bound within endogenous proposals

This configuration retains proposals and acceptance while imposing a wage floor of 8 and ceiling of 10. The relevant comparison is the preceding extension rather than only the basic fixed wage. A proposal below 8 cannot be submitted. The floor changes the firm's feasible set while workers retain rejection rights. A minimum is not added to a variable nobody chooses.

The teaching question concerns distribution, posting incentives, and acceptance under this particular protocol. A job at wage 8 yields a margin of 2 per period, compared with 4 at wage 6. Firms may reduce postings, but greater acceptance can also change hiring. Net direction requires behavior on both sides. The restriction does not change mechanical matching efficiency or separation and does not create a frictionless competitive market.

Examine new proposed wages, acceptance, vacancies, and employment; distinguish existing contracts from new ones when comparing periods. Since the session begins empty, all contracts comply with the floor. Do not interpret it as general evidence about real minimum wages. Productivity heterogeneity, informality, hours, and enforcement costs are absent. The protocol teaches why a wage restriction requires endogenous decisions and a hiring rule to have economic content. Search theory grounds frictions; the bound and parameters are classroom adaptations.



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Period 1 / 15

Post your new openings

Unemployed workers before search: **12**

Jobs retained by your firm: **0**

Cost per posted opening: 1.00 ECU · Production per job: 10.00 ECU · Additional payment per new hire: 0.00 ECU

New openings posted (0–3) Integer wage for new openings (8–10 ECU)

Continue

Figure 4.4: Proposals within a restricted wage interval.

4.10 Announced contraction from period six

Productivity begins at 10 and falls to 8 starting in period six. Instructions announce the schedule, and it applies to all active jobs, including retained ones. The basic wage remains 6. No extra dismissals are drawn and previously submitted openings are not changed. The question studies anticipation and adjustment to a known fall in margins.

Firms may reduce postings before the change because surviving early relationships face smaller future margins. They might also hire earlier if they expect limited later availability. This guide does not guarantee a unique response. Compare earlier and later periods while acknowledging horizon progression and employment accumulation. A jump in earnings does not establish a jump in behavior: production per job changes mechanically.

This dynamic adaptation differs from comparing constant productivities. Describe postings, employment, and separations around the change. Causal attribution would require an unchanged reference with the same horizon and initial states plus several economies. The report does not estimate impact from a before-after comparison. Ask students to construct an explicit counterfactual using identical employment and productivity 10, then separate that mechanical difference from decisions that would have changed.

Your role: Firm · Active periods: 15

First, jobs ending this period are determined. Firms then choose new openings and unemployed workers are available to search. The program assigns encounters and finally settles earnings.

The same four firms and twelve workers remain in the economy. An accepted job continues into the next period unless it ends by lottery.

Each firm posts between 0 and 3 new openings. It pays for every posted opening, even if unfilled. Retained jobs do not incur that posting cost again.

Let S be the number of available job seekers and V the total new openings. Expected encounters are $\min(S, V, \eta \times \sqrt{(S \times V)})$. The integer part is taken and one encounter is added with probability equal to the fractional part. Workers and openings are assigned randomly without duplication. An encounter may fail to occur even when openings exist.

New jobs pay 6 ECU per period and are accepted automatically.

All unemployed workers automatically participate in search at no cost. Workers with retained jobs do not search for another opening.

Production per job changes from 10 to 8 starting in period 6. This schedule is known from the beginning.

Figure 4.5: Announced schedule changing production per job.

Cost per posted opening	1.00 ECU
Production per job	10.00 ECU
Probability each job ends	10.00%
Assignment coefficient η	0.60
Additional payment per new hire	0.00 ECU
Search cost	0.00 ECU

Firm: $100 + \text{productivity} \times \text{final employment} - \text{wages paid} - \text{cost} \times \text{posted openings} + \text{payment per new hire}$.

Worker: wage when employed; 2 ECU when unemployed; minus search cost when applicable.

All earnings are expressed in ECU and are added across the activity. Roles have different payoff rules; their totals do not provide a common performance ranking.

Figure 4.6: Parameters and earnings rules.

Report, discussion, and assessment

5.1 Progress and report disclosure

The instructor report is a private administrative page. Opening it shows language through its text, treatment, participants, economies, and progress without projecting individual choices. Progress counts completed economy periods against expected active economy periods. A one-interaction session need not complete the model's fifteen technical rounds before disclosure. An extended session must complete all fifteen active periods in every economy.

Aggregates stay hidden until the instructor presses Reveal aggregates. The button becomes available only at completion. Hide aggregates reverses disclosure, and reloading hides them again. This protects decision sequencing: partial results should not guide groups still making choices. Pending periods are excluded from calculations. With no completed periods there are no economic means to interpret as zero.

The summary presents role-specific earnings, median postings, and hiring rates over searchers, openings, and encounters. Mean proposed wage uses firms posting at least one opening and does not weight each firm by its number of openings. Mean contractual wage uses observed active jobs and may include older contracts. Compare denominators before explaining differences between proposals and worker earnings. Observed duration uses worker-period observations unemployed at closing; it is not a mean of completed spells.

5.2 Reading the visualizations

The postings distribution shows decision frequencies from zero through three. Sample size counts firm-period decisions in completed periods rather than unique firms. A persistent firm contributes several responses; histogram inclusion does not make them independent. Use the distribution to describe heterogeneity and boundaries. Median postings help identify whether a typical response lies at an extreme but do not replace the full distribution.

The unemployment-vacancy scatter uses proportions from zero to one on both axes. Every point is an economy period with measurement before matching. Repeated coordinates may overlap. A missing visible slope does not itself refute a stationary relationship; initial states, bounds, and adjustment can dominate. The plot neither mixes treatment sessions nor estimates a regression. Preserve reports from separately created sessions when comparing them and explain assignment conditions.

The evolution table shows period, completed economies, earlier and later unemployment, vacancies, hires, and separations. With several completed economies, unemployment and vacancy proportions use their total labor force. Overall hiring rates sum numerators and denominators instead of

Instructor report: job search and vacancies

Reference

Participants

16

Economies

1

Completed economy periods

0 / 1

Pending

1

Progress counts active economy periods, not technical rounds. Pending observations are excluded from aggregates.

Reveal becomes available when all active periods are complete.

Reveal aggregates

Figure 5.1: No completed periods: progress and blocked disclosure.

Instructor report: job search and vacancies

Reference

Participants

16

Economies

1

Completed economy periods

0 / 1

Pending

1

Progress counts active economy periods, not technical rounds. Pending observations are excluded from aggregates.

Reveal becomes available when all active periods are complete.

Reveal aggregates

Figure 5.2: Partial progress before economy completion.

Instructor report: job search and vacancies

Wage proposals and acceptance

Participants

16

Economies

1

Completed economy periods

15 / 15

Pending

0

Progress counts active economy periods, not technical rounds. Pending observations are excluded from aggregates.

Reveal aggregates

Figure 5.3: Completed report before explicit disclosure.

Flow and earnings summary

Measure	Value	n
Mean firm earnings	106.80	60
Mean worker earnings	4.80	180
Median openings per firm	2.00	60
Hires / job seekers	0.27	74
Hires / posted openings	0.21	96
Hires / encounters	0.41	49
Mean wage proposed by posting firms	6.00	46
Mean wage of active jobs	6.00	126
Mean observed duration	6.98	54

Rates pool numerators and denominators. A zero denominator is shown as a dash. Search may be a choice in the extended edition.

Observed duration counts consecutive unemployed closing periods. Ongoing spells are censored; the mean does not estimate full spell duration.

Workers unemployed at final closing: 3 / 12

Public payments: 108.00 ECU

Figure 5.4: Aggregate summary with identified denominators.

averaging percentages with different exposure sizes. A dash denotes a zero denominator rather than a zero success rate.

The final count identifies workers still unemployed. Their spells are censored by the horizon: we do not know when they would end. Mean duration observed at each closing overweights long spells because they appear repeatedly. Use it as a descriptive measure of accumulated exposure rather than an unbiased estimate of full unemployment duration. This distinction introduces survival analysis without pretending the class produced missing information.

Distribution of posted openings

$n = 60$

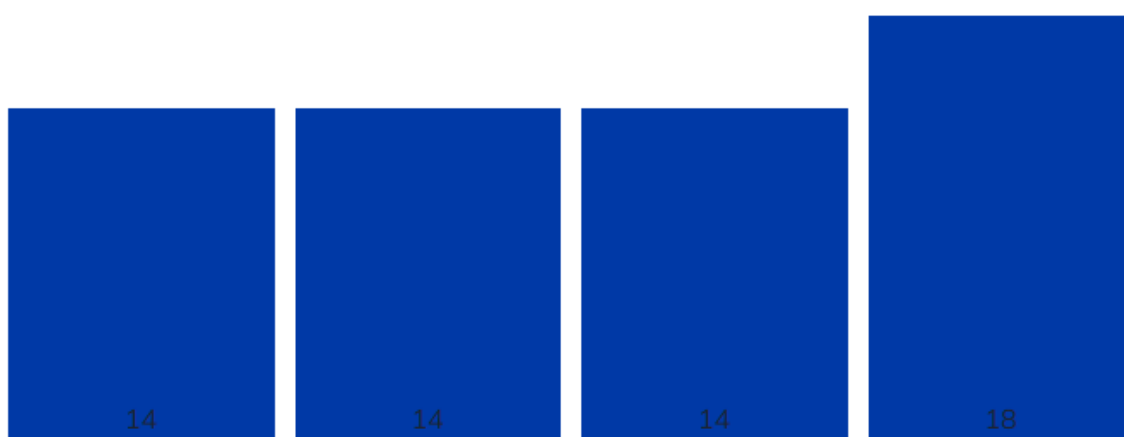
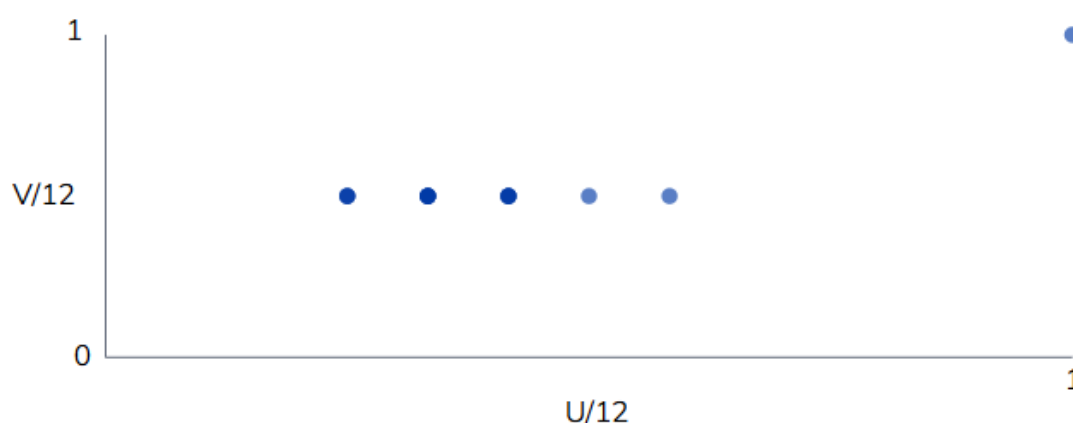


Figure 5.5: Frequency of new openings by firm and period.

Unemployment and vacancies before matching



Each point is an economy period: horizontal axis $U/12$ before search; vertical axis $V/12$. Measurement timing is aligned. No causal curve is fitted and stationarity is not assumed.

Figure 5.6: Unemployment-vacancy pairs with aligned measurement timing.

Evolution by period

Period	n	Unemployment before matching	Closing unemployment	V/12	New hires	Jobs that ended
1	1	1.00	0.50	1.00	6	0
2	1	0.58	0.42	0.50	2	1
3	1	0.42	0.25	0.50	2	0
4	1	0.33	0.25	0.50	1	1
5	1	0.25	0.25	0.50	0	0
6	1	0.25	0.25	0.50	0	0
7	1	0.33	0.33	0.50	0	1
8	1	0.33	0.33	0.50	0	0
9	1	0.42	0.33	0.50	1	1
10	1	0.42	0.33	0.50	1	1
11	1	0.50	0.25	0.50	3	2
12	1	0.33	0.25	0.50	1	1
13	1	0.25	0.25	0.50	0	0
14	1	0.42	0.25	0.50	2	2
15	1	0.33	0.25	0.50	1	1

Figure 5.7: Session stocks and flows by period.

5.3 An adaptable class plan

For a sixty-minute class, reserve ten minutes for access and rules, five for comprehension, fifteen for ten periods, twenty for discussion, and ten for a written exercise. Actual pace depends on reading and devices. If access is delayed, reduce subsequent comparisons rather than rushing comprehension. A created session does not change horizon during play; choose a shorter configuration before starting if necessary.

Discussion begins with reconstruction, continues to interpretation, and ends with limitations. First ask what each role did and which part was random. Next reconstruct one period's employment balance and earnings. Then reveal the report and ask whether vacancies and unemployment coexisted, which mechanism allowed this, and which denominator each rate uses. Only afterward present the stationary reference and predictions. This order prevents a figure from becoming an answer students try to imitate.

Feedback script

How many jobs survived and how many began? Which unemployment existed before postings? Did an unfilled opening incur cost? Does increased hiring necessarily raise production in the same proportion? Before comparing sessions, identify the changed parameter and conditions held constant.

Introductory courses can close with stocks, flows, and randomness. Intermediate macroeconomics can add relationship value, stationary reference, and movement versus shifts. Policy classes can use hiring payments or wage proposals and separate distribution, resources, and causal evidence. Assessment should reward correct explanation even if the session does not produce the expected slope. Do not grade students by earnings because role and lottery partly determine them.

Worked exercises and data

6.1 Reconstructing employment and earnings

Suppose an economy ended the preceding period with eight jobs. Two workers separate at the current beginning. Firms post five openings, all unemployed workers search, and three hires occur at wage 6. Find retained employment, initial unemployment, closing unemployment, and finding and filling rates. Retained employment is six, initial unemployment six, and final employment nine. Closing unemployment is three. The finding rate is $3/6 = 0.5$, and filling is $3/5 = 0.6$. The scatter point is $(6/12, 5/12)$ rather than $(3/12, 5/12)$.

Now a firm retains two jobs, posts two openings, and obtains one new hire. Under basic parameters, it ends with three jobs and a wage bill of 18. Earnings are $100 + 10 \times 3 - 18 - 2 = 110$. An unfilled opening still incurs cost, so both postings are paid. A newly hired worker earns 6 and an unemployed worker 2. Economy production is $10 \times 9 = 90$, and benefits total 6. Do not add wages and production and count resources twice.

For verification, nine closing jobs must equal eight earlier jobs minus two separations plus three hires. A record of ten would be inconsistent. Grade the exercise using sequence, conservation, denominators, and earnings. Percentages without the unemployment measurement moment are incomplete even if numbers appear plausible.

6.2 Rounding, uncertainty, and choice

With eight searchers, seven openings, and efficiency 0.6, expectation is $0.6\sqrt{56} \approx 4.49$. Four encounters occur with probability near 0.51 and five with probability near 0.49. Before the lottery and under symmetry, an individual's expected encounter probability is $4.49/8 \approx 0.56$. Probability per opening is $4.49/7 \approx 0.64$. Neither means a particular person or opening receives a fraction of a match.

If one firm has two of those seven openings, its expected encounters are $2 \times 4.49/7 \approx 1.28$, conditional on quantities. Multiplying by margin 4 gives a current expected earnings component but ignores that changing its postings changes total openings and expectation. To assess one additional opening, recalculate with eight openings. Marginal comparison holds other firms' decisions constant rather than the original filling rate.

Ask why some participants might post less than current expected-income maximization suggests. Risk or beliefs about rivals are admissible explanations, as is misunderstanding. None is identified by posting count alone. Ask which additional measure would distinguish them. The exercise separates describing a deviation, proposing a mechanism, and establishing it with evidence. It does not require assigning personal traits to classmates.

6.3 Rejected proposals and voluntary search

Suppose four encounters are assigned and one wage proposal is rejected. Hires equal three. With eight searchers and six openings, finding is $3/8$, filling $3/6$, and encounter acceptance $3/4$. Using four in the hiring numerator would conceal rejection. The rejected opening still incurs posting cost and receives no replacement worker. If hiring payments were 2, only three hires would qualify; that combination is counterfactual because available configurations separate the two treatments.

Under voluntary search, six workers are unemployed but only four search. If two obtain jobs, hires over searchers equal $2/4 = 0.5$, while hires over initial unemployment equal $2/6 \approx 0.33$. The former concerns success among actual participants; the latter concerns exits from the unemployed stock. Two nonsearchers continue receiving 2. Two unsuccessful searchers receive 1. Those hired at wage 6 receive 5 that period.

Compare with six hypothetical searchers and identical openings. Do not automatically assume the same two hires: encounter expectation changes with search input. A correct exercise recalculates expectation before recognizing that realization may vary. The comparison teaches selection, congestion, and participation costs without turning one response into a universal conclusion about unemployment.

6.4 Duration and censoring: missing observations

Consider a worker unemployed for three closings and hired in the fourth. Recorded duration is 1, 2, and 3 while unemployed, then zero after hiring. If another worker remains unemployed at the session's final closing, we do not know when a later hire would occur. The first spell ended and the second remains open. They must not be combined as if both full lengths were known.

The mean of observations 1, 2, and 3 is 2 even though the completed spell lasted three closings. This demonstrates why the report's mean has a particular descriptive definition. Long spells contribute several observations and open spells reveal no endpoint. Duration estimation from exports would require constructing spells, defining entry time, marking censoring, and choosing an appropriate method. Dependence among people sharing an economy would also matter.

Ask which additional information would reveal a completed spell. Extending the horizon adds observation but changes incentives and conditions, so it is not statistically neutral. Independent encounters reset duration because employment resets. Do not compare their mean with persistent duration as though the measures represented the same phenomenon. The distinction introduces the connection between experimental design and variable meaning.

6.5 Data, privacy, and auditability

Private exports retain session, economy, period, language, edition, treatment, grouping rule, and seed. Participant records include role, decisions, proposed wage, search, acceptance, relationship, contractual wage, separation, encounter, new hire, duration, and earnings. Aggregate results retain encounter expectation, stocks and flows, public expenditure, and production. This structure audits duplicate workers and prevents hiring payments on rejected openings.

Technical participant identifiers privately reconstruct trajectories. They must not appear in slides, guides, or projected reports. Prepare a separate analysis copy removing direct identifiers and links. Persistent anonymous labels may still permit recognition when combined with classroom information, so share only what the teaching objective requires. Link and monitor screenshots in this guide conceal identifiers.

Keep rules with the data. Decisions without parameters may make low productivity, high costs, and few random hires indistinguishable. Seeds reproduce lotteries given identical states and quantities but do not make sessions with different decisions identical outcome pairs. Causal policy analysis requires documented assignment, replication, and dependence within economies. The report supports classroom description rather than replacing that design.

6.6 Troubleshooting and closing checklist

If someone remains waiting, inspect the economy's private monitor. A firm decision, worker confirmation, or wage acceptance may be missing. Do not ask students to announce choices publicly. First verify that each device opened its own link and that nobody closed the page. Preserve session and database before recovery from network interruptions. Resetting a database to resolve waiting destroys the continuity required by the game.

If a form rejects an entry, check integer values, bounds, and required fields. Zero openings is valid. Wage proposals range from 2–10 normally and 8–10 with the bound. A retained worker should not see a new search choice; this is protocol rather than a missing form. If another language, internal identifier, or unrelated configuration appears, record the affected screen instead of improvising oral rules that change treatment.

Before closing, confirm every economy finished its active periods, reveal the report when appropriate, and complete at least one numerical balance. Then hide results, save exports and configuration privately, and record incidents affecting interpretation. Create a new session for the next class. Delivered materials include editable sources, PDFs, and figures; production numbering remains in technical records and never supplies titles for students or instructors.

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