



Teacher guide to the continuous double auction

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 helps you prepare, run, and discuss in class the **continuous double auction** game developed for the Behavioral and Experimental Economics Research Lab (BEER Lab) of the Department of Economics at Tecnológico de Monterrey. It is written for instructors of principles of economics, intermediate microeconomics, and industrial organization, with or without prior experience in experimental economics.

The **quick guide** is enough to launch a session. The operational chapters explain each screen. The conceptual chapters present the theoretical benchmarks and the evidence needed to interpret the results. Common rules are explained once; the extended variant only states what changes relative to the baseline game.

Author

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For the instructor

This guide covers the English interface. A separate Spanish version exists. The screens in this guide were captured on a local instance of the game with simulated decisions; the numbers they show illustrate the interface and are *not* results from a class. Project aggregate results only: do not link codes to names, student IDs, seats, or individual decisions.

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Quick implementation guide

1.1 Fact sheet

Purpose	Observe how a market in which each person knows only their own value or cost finds the competitive equilibrium price and quantity, and measure how much of the possible gains from trade is realized (efficiency).
Participants	The whole class forms <i>a single market</i> . Half are buyers and half sellers; with an odd number there is one extra buyer. With 22 or more students the theoretical benchmark no longer changes (11 units at a price of 150).
Market	Buyer values: 300, 285, 270, ... (down 15 per rank). Seller costs: 0, 15, 30, ... (up 15 per rank). Rank assigned at random when the session is created and fixed across periods.
Decision	For 180 seconds, in real time: propose a price (a bid or an ask) or accept the best offer from the other side. At most one unit per person per period.
Earnings	Buyer: value – price. Seller: price – cost. Zero without a trade. Never negative: the platform blocks loss-making trades.
Duration	10–15 minutes for one period; 35–45 minutes for eight periods, not counting the discussion.
Instructor (you)	teaching-admin.beer-lab.org/en → game card → Open panel . It asks for a username and password (section 2.1).
Students	Room link doubleauction.beer-lab.org/room/double_auction_en , its QR code (section 2.5), or teaching.beer-lab.org .
Report	Equilibrium quantity, price and price band; average efficiency; average price by period; early versus late periods; price histogram and table by period.

Attention

There are two different pages. **teaching-admin.beer-lab.org** is yours: from there you enter the game panel and download this guide. **teaching.beer-lab.org** is your students' page: from there one can only *play*, not create sessions.

1.2 Minimum sequence

Before class

1. Request panel access from lab.economia@servicios.tec.mx, stating the game, course, number of students, and date. You will receive the password for the user **admin**.
2. Open teaching-admin.beer-lab.org/en, find **Continuous Double Auction**, and click **Open panel**. Enter the username and password.
3. Rehearse in **Demo**: open a configuration and play with the eight tabs of the practice session to get to know the screens and the report (section 2.3).
4. Choose the mode (one period or eight periods) or the extended variant with chat.

In class

5. Count the students present: the whole class forms a single market.
6. In the panel, open **Rooms** and the room **[EN] Continuous Double Auction** (or the extended one). Choose the configuration, enter the *exact* number of students in **Number of participants**, and click **Create**.
7. Share the room link or project its QR code. Each student clicks **Start**.
8. In the room, click **Monitor the session**: the session page opens, with the tabs **Monitor** (progress) and **Report** (report). When the last period ends, open **Report**, click **Show results**, and lead the discussion.

After class

9. In the room, click **Close this room**. This makes it ready for the next group; the session data are kept under **Sessions**.

1.3 Checklist

- ☐ Panel password received and tested at doubleauction.beer-lab.org/login.
- ☐ Rehearsal done in **Demo**.
- ☐ Devices, internet, browser, and projector ready. Each student needs their own device: trading happens in real time.
- ☐ Mode or variant chosen according to the class question and the time available.
- ☐ Number of participants in the session equal to the number of students present: the market does not open until everyone arrives.
- ☐ Room link or QR code at hand (section 2.5); tested from a phone.
- ☐ Students told that ECU are experimental units and that there is no cash payment.
- ☐ Monitor and report open; value and cost ladder (table 5.1) at hand for the discussion.

Accessing the platform

2.1 Your access: teaching-admin and the game panel

The instructor page is teaching-admin.beer-lab.org/en. It is not in the beer-lab.org menu: type the address directly or bookmark it. It gathers all the lab's classroom games; you can search by title, topic, or JEL code.

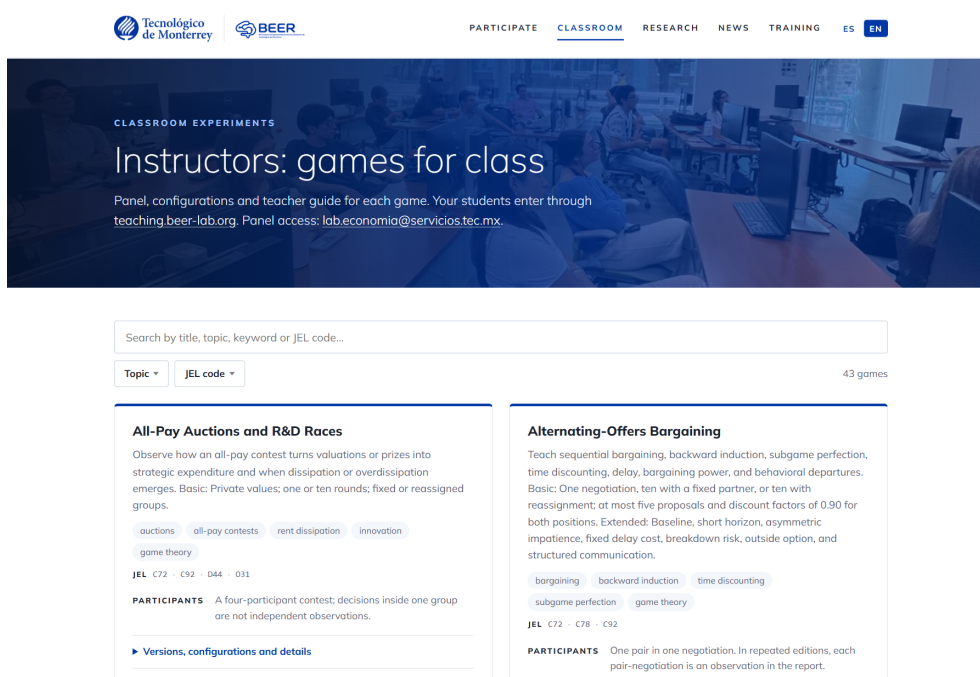


Figure 2.1: Instructor page: teaching-admin.beer-lab.org.

Each game has a card with its description, number of participants, and duration, and two buttons: **Open panel**, which takes you to the game panel, and **Teacher guide (PDF)**, which downloads this guide (the **ES** link downloads the Spanish version).

Continuous Double Auction

One market for the whole class: buyers and sellers with private values and costs trade one unit per period in real time, posting prices and accepting the best opposing offer (Smith, 1962). One period or eight periods, plus an extended version with chat.

competitive markets

price discovery

efficiency

induced values

market institutions

JEL C92 · D41 · D44 · D47

PARTICIPANTS One market per session; about half buyers and half sellers. Works with any class size (high-rank participants are extramarginal by design).

DURATION Approx. 15 min (one period) · 45–60 min (eight 3-minute periods), including instructions and comprehension check.

► **Versions, configurations and details**

Open panel

Teacher guide (PDF)

ES

Figure 2.2: Game card on the instructor page.

Expanding **Versions, configurations and details** shows the list of rooms, with the configurations of each. Each **open panel** link in that list goes straight to the form for creating a session in that room (after you log in).

- **Español:** [open panel](#) — configurations: *[ES] Subasta doble — un periodo*, *[ES] Subasta doble — 8 periodos*
- **English:** [open panel](#) — configurations: *[EN] Double auction — one period*, *[EN] Double auction — 8 periods*
- **Español · extendido:** [open panel](#) — configurations: *[ES] Subasta doble extendida — con chat, 8 periodos*
- **English · extended:** [open panel](#) — configurations: *[EN] Double auction extended — with chat, 8 periods*

Figure 2.3: The game’s rooms on the expanded card: basic and extended, in Spanish and English.

The game panel (<https://doubleauction.beer-lab.org>) is protected. **Open panel** shows the **Admin Login** screen: enter **admin** under **Username** and the password the lab gave you under **Password**. If you do not have it, request it from lab.economia@servicios.tec.mx.

Figure 2.4: Game panel login.

2.2 The panel: minimum vocabulary

The panel is oTree’s admin interface. These are the only terms you need:

Demo	Practice sessions. Creates a session with dummy participants that you play yourself in several tabs. Use it to rehearse, never with students.
Rooms	Fixed addresses for class. Each game has four: basic and extended, in Spanish and English. Your students always join through a room.
Create / Number of participants	Create the session in the room and declare how many people will play.
Monitor	Table with the period and screen each participant is on. It does not show prices or roles.
Advance slowest participants	Monitor button that moves forward whoever has fallen behind (section 2.4).
Report	The instructor report for projecting aggregate results.
Data	Data download in CSV.
Sessions	List of all your sessions, to return to an earlier one.
Close this room	Frees the room when you finish, for the next group.

In this panel, **Demo** lists only this game’s six configurations and **Rooms** only its four rooms. If another game appears, do not start the session and notify the lab.

Demo	
[ES] Subasta doble — un periodo	Juegos de mercados / Market games — BEER Lab Subasta doble continua / Continuous double auction
[ES] Subasta doble — 8 periodos	
[EN] Double auction — one period	
[EN] Double auction — 8 periods	
[ES] Subasta doble extendida — con chat, 8 periodos	
[EN] Double auction extended — with chat, 8 periods	

Figure 2.5: Demo: the game’s six configurations (four basic and two extended, in Spanish and English).

oTree Demo Sessions Rooms Data Server Check	
Rooms	
Current rooms:	
[ES] Subasta doble continua	
[EN] Continuous Double Auction	
[ES] Subasta doble continua — extendido	
[EN] Continuous Double Auction — extended	

Figure 2.6: Rooms: the game's four rooms.

2.3 Rehearsing before class

In **Demo**, click a configuration: a practice session is created and its links page appears. In this game the practice session always has eight participants (four buyers and four sellers), and each period starts only when all eight reach the waiting screen. Open each link **P1**, **P2**, ..., **P8** in a separate tab and take each one to the trading screen, as if you were each student; then open **Report**. These sessions do not affect your classes.

oTree Demo Sessions Rooms Data Server Check

[EN] Double auction extended — with chat, 8 periods: session '0vulhi3c' (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
Not available ⓘ

Grid view
[Launch](#)

Session-wide testing link
Open the below link in up to **8** browser tabs.
<http://localhost:8023/join/halizuta>

Single-use links
Open each link in its own browser tab.

P1	http://localhost:8023/InitializeParticipant/xsobnjga
P2	http://localhost:8023/InitializeParticipant/370ojhta
P3	http://localhost:8023/InitializeParticipant/wabt5i7h
P4	http://localhost:8023/InitializeParticipant/lI296wli
P5	http://localhost:8023/InitializeParticipant/fe539ymh
P6	http://localhost:8023/InitializeParticipant/nc6cm1em
P7	http://localhost:8023/InitializeParticipant/wgicI9gu
P8	http://localhost:8023/InitializeParticipant/tj1v968r

Figure 2.7: Links of a practice session with eight participants. The screenshots in this guide were taken on a local copy, which is why the addresses say `localhost`; on the server they say `doubleauction.beer-lab.org`.

Attention

Do not rehearse with the room link open in several tabs of the same browser: oTree recognizes the browser and all tabs would be the same person. Use **Demo** to rehearse.

2.4 Creating the session in class

In **Rooms**, open the room for the language you will use. The form only offers that room's configurations. Choose the configuration, enter the number of students present in **Number of participants**, and click **Create**.

The screenshot shows the oTree web interface. At the top is a navigation bar with links: oTree, Demo, Sessions, Rooms, Data, and Server Check. The main heading is "Room: [EN] Continuous Double Auction". Below this is a sub-heading "Create a new session". A light blue box contains the text: "English room. Only the configurations of this game, language and edition are shown below." Underneath, there is a "Session Config" section with a dropdown menu currently showing "[EN] Double auction — one period". Below that is the "Number of participants" section with an empty input field and a note "Must be a multiple of 1". A blue "Create" button is positioned below the input field. Further down, there is a link "Configure session" with a gear icon. The "App sequence" section shows a selected option "double_auction (8 rounds)" and a description: "Continuous double auction with induced supply and demand: buyers and sellers trade a single unit per period, optional chat."

Figure 2.8: Form of the basic English room: only its two configurations appear.

Before creating the session, **Configure session** lets you change the length of each period (`trade_seconds`, 180 by default) and the number of periods (`active_rounds`, 1 to 8). The participant instructions adjust to these values automatically. Shortening the period to 120 seconds is the simplest way to save time in a 50-minute class; below 90 seconds, people who take time to read the market are left out.

After you click **Create**, the room shows that a session is taking place, with the links **Monitor the session** and **Close this room**.

oTree Demo Sessions Rooms Data Server Check

Room: [EN] Continuous Double Auction

Session **aseaanxo** is taking place in this room.

[Monitor the session](#) 

Close this room

Start links

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

Room-wide URL

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

http://localhost:8023/room/double_auction_en

Hard-coded links

Generally, you should provide your participants with the room-wide URL above. But in special cases where you need to open (or re-open) a specific participant's link, by using the participant code, you can use the below links.

► Show/Hide

Figure 2.9: Room with a session in progress.

Attention

Declare the exact number, with no spare places. The lab's general guide suggests creating a few extra places; not in this game. Roles and ranks are assigned to *all* declared participants when the session is created, and each period starts only when the whole group has reached the waiting screen. If you declare more participants than actually join, trading never starts. The cleanest fix is to click **Close this room** and create a new session with the correct number. **Advance slowest participants** can push the empty slots through, but they remain buyers or sellers who never trade: they still count toward the theoretical benchmark and lower measured efficiency.

If one student more than declared arrives, they will see the message “La sesión está llena” (“the session is full”), in Spanish even in the English rooms. In that case, before starting, click **Close this room**, create another session with the correct number, and ask everyone to open the link or QR code again.

Attention

The trading period has a timer: it ends after 180 seconds even if someone has closed their browser (on the lab server, oTree submits the expired page by itself). Pages without a timer—cover, instructions, comprehension check, and period result—do hold up the whole class: if someone does not click **Next period**, nobody starts trading. If a student got disconnected, ask them to reopen the room in the same browser: they resume where they were. If they cannot, use **Advance slowest participants** in the Monitor. The button advances at most 20 participants per click and acts on those furthest behind; if you click it while everyone is trading, it closes the period for those 20 people. An advanced participant simply does not trade in that period (earnings 0).

oTree Demo Sessions Rooms Data Server Check										
[EN] Double auction — 8 periods: session '4r8oo41z'										
<a>Edit <a>Links <a>Monitor <a>Data <a>Payments <a>Report <a>Description										
ID	Code	Label	Progress	App	Round	PageName	Waiting	WaitsFor	Since	
P1	lrs3qn3c		27/80	double_auction	3	Trade			1m	
P2	s168n8g5		27/80	double_auction	3	Trade			1m	
P3	s3b3vkdb		27/80	double_auction	3	Trade			1m	
P4	wty15tq5		27/80	double_auction	3	Trade			1m	
P5	qu0kl00h		27/80	double_auction	3	Trade			1m	
P6	f5ec15mp		27/80	double_auction	3	Trade			1m	
P7	ejy2pypn		27/80	double_auction	3	Trade			1m	
P8	7xa0a1yl		27/80	double_auction	3	Trade			1m	
P9	zo2wvcoe		27/80	double_auction	3	Trade			1m	
P10	mrlivco		27/80	double_auction	3	Trade			1m	

Figure 2.10: Monitor: period and page of each participant, without showing prices or roles.

2.5 How your students join

Students need no account and nothing to install; the browser on their phone or computer is enough. They have three routes, all leading to the same room:

1. **QR code.** Project the one for the room you will use (below, and full size in appendix A). They scan it with their phone camera.
2. **Room link.** Share it through the class chat or Canvas: https://doubleauction.beer-lab.org/room/double_auction_en.
3. **Catalogue.** At teaching.beer-lab.org they look for **Continuous Double Auction** and click the button for their language (**English**, or **English · extended** if they tick **Show extended version**).

**English, basic**

`doubleauction.beer-lab.org`
`/room/double_auction_en`

**English, extended**

`doubleauction.beer-lab.org`
`/room/double_auction_extended`

**Español, básica**

`doubleauction.beer-lab.org`
`/room/double_auction_es`

**Español, extendida**

`doubleauction.beer-lab.org`
`/room/double_auction_extendido`

What participants will see

Students open the room and click **Start**. If you have not created the session yet, the room shows a short waiting message in Spanish (“Por favor espere”, “please wait”) and lets them in automatically once you create it; so you can share the link or QR code from the start of class. They need no email or password: they receive an anonymous code.

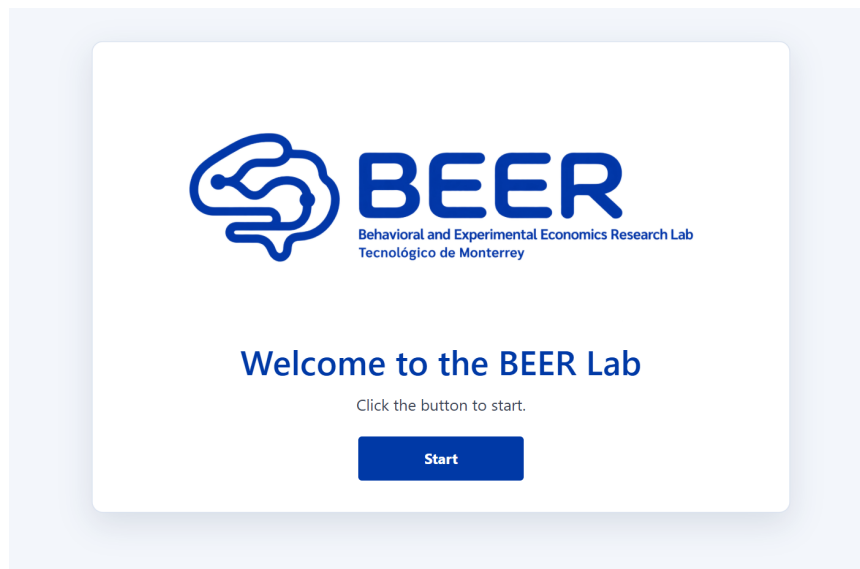


Figure 2.11: Room as the student sees it.

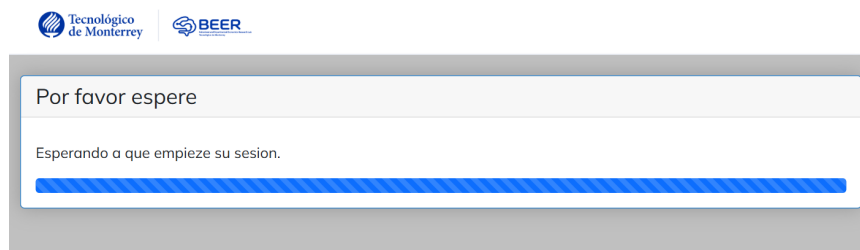


Figure 2.12: Student waiting screen if the session does not exist yet. oTree shows it in Spanish, also in the English rooms.

Language is set by room: a session created in the English room only admits those who join through the English room. Since the whole class forms a single market, if your group is mixed choose one language for everyone.

Continuous Double Auction

One market for the whole class: buyers and sellers with private values and costs trade one unit per period in real time, posting prices and accepting the best opposing offer (Smith, 1962). One period or eight periods, plus an extended version with chat.

competitive markets

price discovery

efficiency

induced values

market institutions

JEL C92 · D41 · D44 · D47

Address: `doubleauction.beer-lab.org`

Español

English

Español · extendido

English · extended

☒ Show extended version

Figure 2.13: Game card on teaching.beer-lab.org, the students' page.

The baseline game and its screens

3.1 Rules, incentives, and benchmarks

When the session is created, the platform shuffles the participants. The first half (rounded up) are buyers and the rest sellers. Within each side, the order defines a *rank*, which sets the person's value or cost:

$$v_i = \max(0, 300 - 15(i - 1)), \quad c_j = 15(j - 1),$$

where i is the buyer's rank and j the seller's. Role, rank, and value or cost are the same in every period, as in the original design of [Smith \(1962\)](#); this makes learning and convergence visible. Each person sees only their own value or cost.

In each period, each buyer can buy one unit and each seller can sell one. A buyer with value v who buys at price p earns $v - p$; a seller with cost c who sells at p earns $p - c$. Anyone who does not trade earns 0.

For the instructor

Do not reveal the ladder before playing. After the game, ask the class to draw supply and demand from the values and costs each person remembers: this is when the curve stops being an assumption and becomes a sum of people.

3.2 Cover, instructions, and comprehension

The cover page introduces the BEER Lab and the rules of conduct. Participants confirm that they have read them. The instructions depend on the assigned role: buyers read the rule for their value and sellers the rule for their cost. They describe only the action: they do not mention “double auction”, “equilibrium”, or “efficiency”, nor do they suggest a price to trade at.



Welcome to the BEER Lab

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

Today you will take part in a market as a buyer or a seller. Your earnings depend on your decisions.

During the session

- Do not talk or communicate with other people, except through the means shown on screen.
- Make your decisions individually.
- Follow the on-screen instructions. Do not refresh or close this page.
- If you need help, raise your hand.

I have read and understood the lab rules.

☐ Yes ☐ No

Start

Powered by [oTree](#)

Figure 3.1: Cover page and lab rules.

Instructions

Period 1 of 8

In this activity you are a buyer. Each period you want to buy one unit of a product.

Each period you have your own **value** for your unit: the highest price it is worth paying. If you buy at a lower price you earn the difference; if you buy at a higher price you lose. No one else knows your value.

Your earnings = your value – the price you buy at. If you do not buy, your earnings are 0.

Example: if your value is 150 and you buy at a price of 120, your earnings are $150 - 120 = 30$ ECU.

How trading works

- Each period lasts 180 seconds. Buyers propose a price to buy at (a bid) and sellers propose a price to sell at (an ask); everyone sees the two best current offers.
- A new bid is only accepted on screen if it is higher than the current best bid. A new ask is only accepted if it is lower than the current best ask.
- At any time you can accept the best offer from the other side: as a buyer, you can accept the best ask; as a seller, you can accept the best bid. Accepting closes the trade immediately at that price.
- The system will not let you propose or accept a price that would lose you money. You can buy or sell at most one unit per period; if you do not trade, your earnings for that period are 0.

- There will be 8 periods. Your role and your value or cost stay the same in every period. Your earnings from all periods are added up.
- Amounts are in ECU (experimental currency units). There is no cash payment.

[Continue](#)Powered by [oTree](#)

Figure 3.2: Buyer instructions: value, earnings, trading rules.

Instructions

Period 1 of 8

In this activity you are a seller. Each period you want to sell one unit of a product.

Each period you have your own **cost** for your unit: the lowest price it is worth accepting. If you sell at a higher price you earn the difference; if you sell at a lower price you lose. No one else knows your cost.

Your earnings = the price you sell at – your cost. If you do not sell, your earnings are 0.

Example: if your cost is 80 and you sell at a price of 120, your earnings are $120 - 80 = 40$ ECU.

How trading works

- Each period lasts 180 seconds. Buyers propose a price to buy at (a bid) and sellers propose a price to sell at (an ask); everyone sees the two best current offers.
- A new bid is only accepted on screen if it is higher than the current best bid. A new ask is only accepted if it is lower than the current best ask.
- At any time you can accept the best offer from the other side: as a buyer, you can accept the best ask; as a seller, you can accept the best bid. Accepting closes the trade immediately at that price.
- The system will not let you propose or accept a price that would lose you money. You can buy or sell at most one unit per period; if you do not trade, your earnings for that period are 0.

- There will be 8 periods. Each period you are given a new value or cost. Your earnings from all periods are added up.
- Amounts are in ECU (experimental currency units). There is no cash payment.

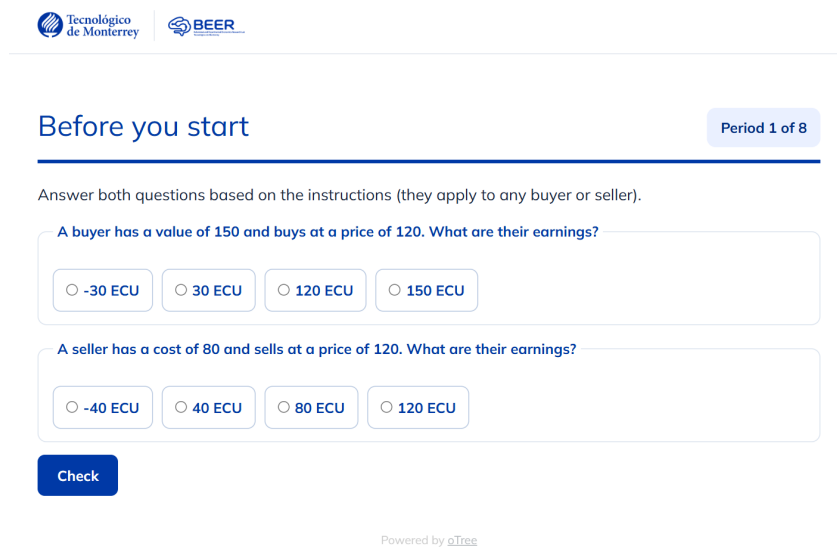
[Continue](#)Powered by [oTree](#)

Figure 3.3: Seller instructions: the same text with cost instead of value.

The example uses a value of 150, a cost of 80, and a price of 120. The check asks for a buyer's and a seller's earnings in that same case (30 and 40 ECU), so that each person also understands the other side of the market. The options include the typical mistakes: answering with the value, with the cost, or with the wrong sign. After an error, the screen restates the rule and allows another attempt; the number of attempts is recorded in the data.

Attention

The example's value (150) coincides with the equilibrium price of a class of 22 or more participants, and the example's price (120) is a cost on the ladder. The example may act as an anchor. When reading the instructions aloud, do not dwell on these numbers or relate them to the market.



Tecnológico de Monterrey | BEER

Before you start

Period 1 of 8

Answer both questions based on the instructions (they apply to any buyer or seller).

A buyer has a value of 150 and buys at a price of 120. What are their earnings?

☐ -30 ECU
 ☐ 30 ECU
 ☐ 120 ECU
 ☐ 150 ECU

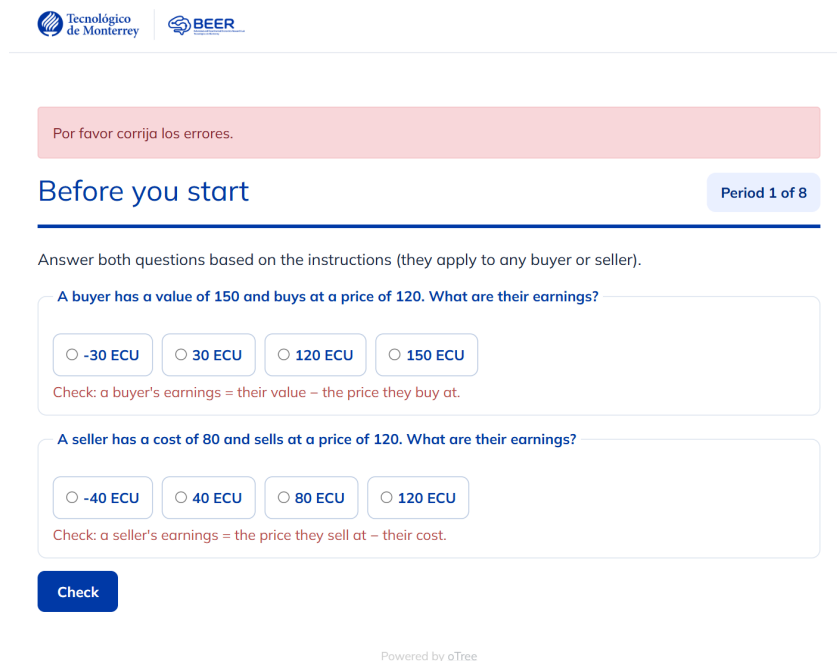
A seller has a cost of 80 and sells at a price of 120. What are their earnings?

☐ -40 ECU
 ☐ 40 ECU
 ☐ 80 ECU
 ☐ 120 ECU

Check

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Figure 3.4: Comprehension check: one question per role.



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Por favor corrija los errores.

Before you start

Period 1 of 8

Answer both questions based on the instructions (they apply to any buyer or seller).

A buyer has a value of 150 and buys at a price of 120. What are their earnings?

☐ -30 ECU
 ☐ 30 ECU
 ☐ 120 ECU
 ☐ 150 ECU

Check: a buyer's earnings = their value - the price they buy at.

A seller has a cost of 80 and sells at a price of 120. What are their earnings?

☐ -40 ECU
 ☐ 40 ECU
 ☐ 80 ECU
 ☐ 120 ECU

Check: a seller's earnings = the price they sell at - their cost.

Check

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Figure 3.5: Wrong answer: the message restates the rule without giving the answer.

When done, each person waits until the whole group arrives. Trading starts at the same moment for the whole class.

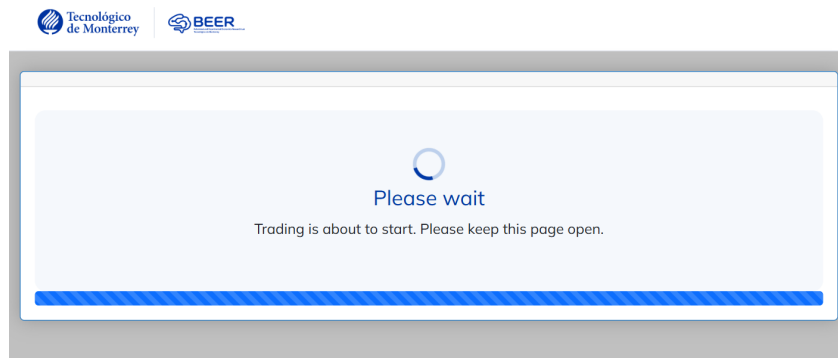


Figure 3.6: Waiting before the market opens.

What participants will see

“Please wait” means that other people in the group have not finished yet. It is not an error. Participants should not close or refresh the page.

3.3 Trading

The trading screen shows the participant’s own value (or cost), the current **best bid** and **best ask**, and the list of trades closed in the period (prices only, identifying nobody). Everything happens in real time: there is no button to submit the page.

- **Propose.** A buyer types a price and clicks **Offer to buy**; a seller, **Offer to sell**.
- **Improvement rule.** A bid only replaces the current one if it is higher; an ask, only if it is lower. At any moment there is at most one offer on each side.
- **Accept.** **Accept the best offer** closes the trade immediately at that offer’s price. The button is disabled while there is no offer on the other side. After each trade, both standing offers are cleared and the market starts over.
- **No losses.** The platform rejects bids above one’s own value, asks below one’s own cost, and acceptances that would lose money. This is a deliberate simplification: the activity focuses on price discovery, not arithmetic.

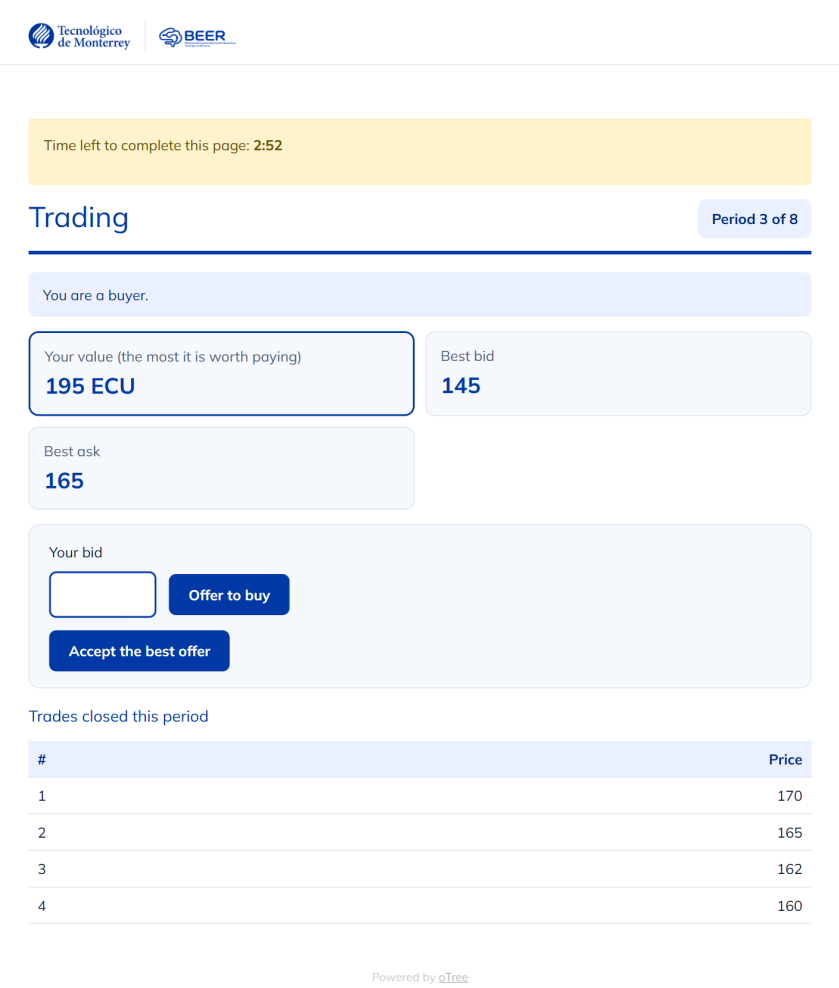


Figure 3.7: Trading as seen by a buyer: standing offers and closed trades (simulated decisions).



Time left to complete this page: 2:52

Trading

Period 3 of 8

You are a seller.

Your cost (the least it is worth accepting)
105 ECU

Best bid
145

Best ask
165

Your ask must be lower than the current best ask and cannot be below your cost.

Your ask

Offer to sell

Accept the best offer

Trades closed this period

#	Price
1	170
2	165
3	162
4	160

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Figure 3.8: A seller's view: the ask of 170 was rejected because it does not improve on the standing ask of 165 (simulated decisions).

Anyone who has already traded sees the price and their earnings and can keep watching the market. The period does not end when trading stops: it always lasts the configured time.




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Trading

Period 3 of 8

You are a buyer.

Your value (the most it is worth paying)

225 ECU

Best bid

—

Best ask

—

Price

145

Your earnings

80 ECU

You have already closed your trade for this period. You can keep watching the market until time runs out.

Trades closed this period

#	Price
1	170
2	165
3	162
4	160
5	145

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Figure 3.9: A buyer who has already traded in this period (simulated decisions).

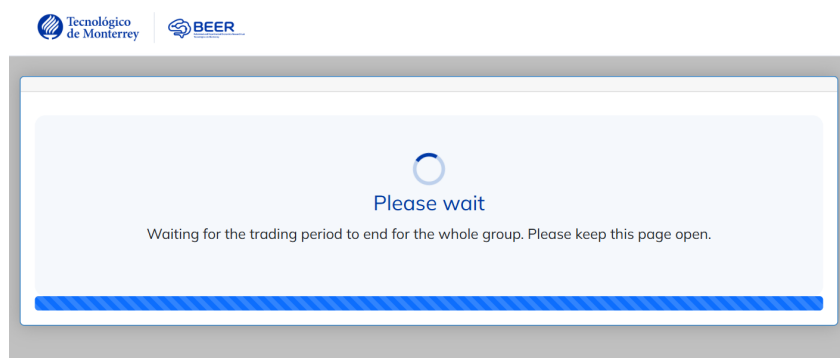


Figure 3.10: Waiting at the end of the period.

3.4 Result and closing

The result screen shows the role, the value or cost, whether a trade took place, the price, the period's earnings, the cumulative earnings, and the list of all prices in the period. The history of previous periods appears on the final screen.

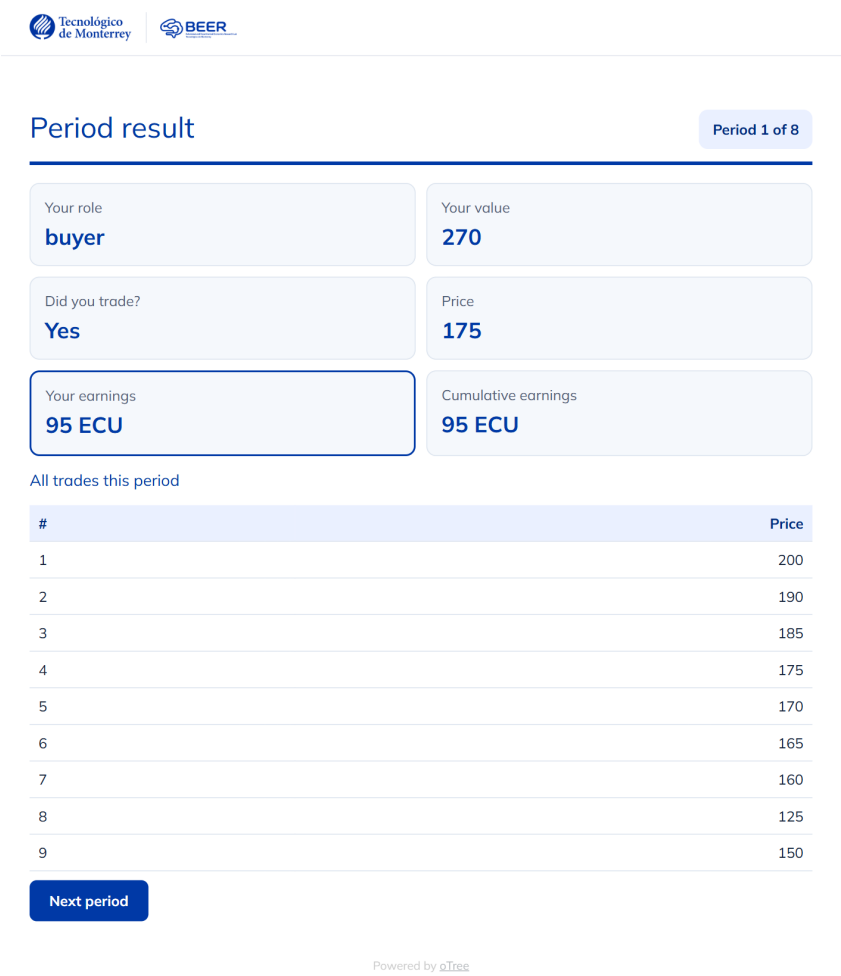


Figure 3.11: Period result (simulated decisions).

End of the activity

Period 8 of 8

Your total earnings

888 ECU

Period	Role	Value / cost	Traded	Price	Earnings
1	buyer	270	Yes	175	95
2	buyer	270	Yes	175	95
3	buyer	270	Yes	162	108
4	buyer	270	Yes	158	112
5	buyer	270	Yes	152	118
6	buyer	270	Yes	151	119
7	buyer	270	Yes	150	120
8	buyer	270	Yes	149	121

Thank you for participating. Please wait for your instructor.

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Figure 3.12: Closing: total earnings, history, and instruction to wait for the instructor.

Instructor report and debrief

4.1 When to reveal

Report is a tab of the session page: reach it from the room with **Monitor the session**, or from **Sessions** if the session has already ended. It opens with the results hidden. At the top it shows the number of participants, buyers, sellers, and completed periods, so you can project it from the start without giving anything away. Click **Show results** when the counter reaches the total number of periods; **Refresh** adds new periods and **Hide results** covers them again.

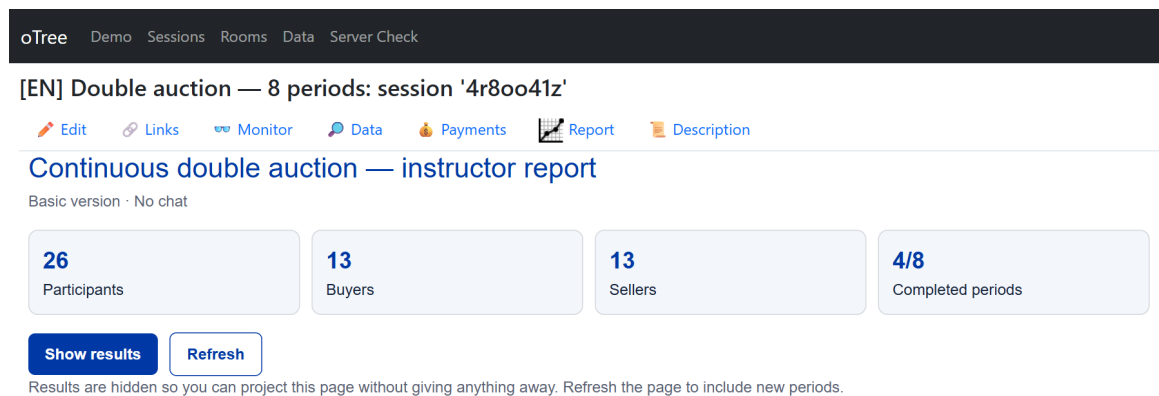


Figure 4.1: Report with results hidden and progress counter.

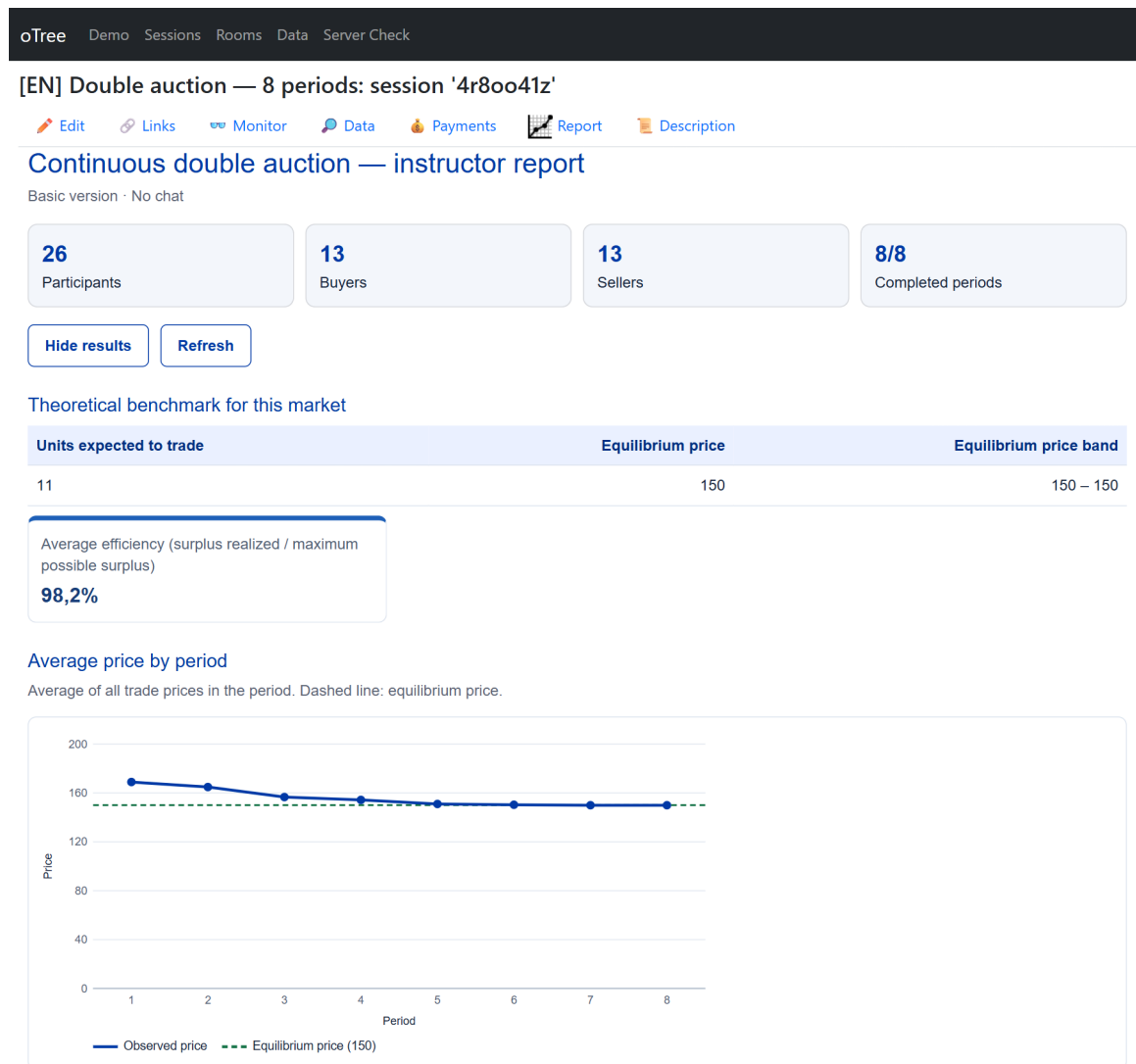


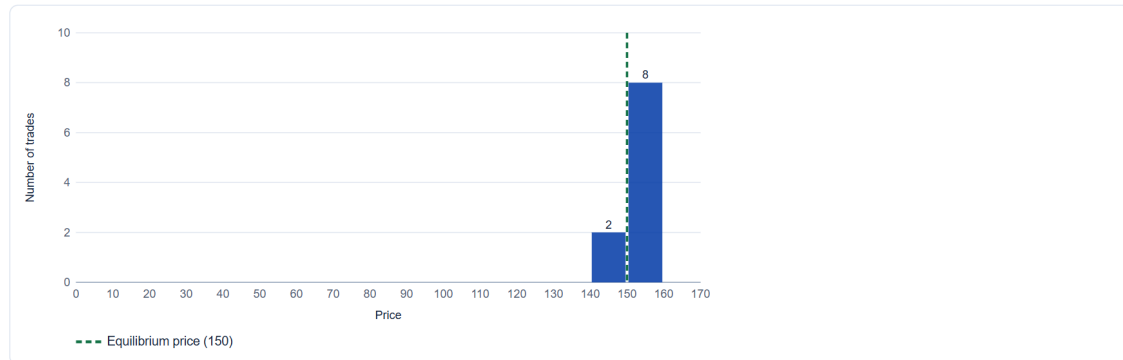
Figure 4.2: Report revealed: theoretical benchmark, efficiency, and average price by period (simulated decisions, 26 participants).

Early periods versus late periods (efficiency)

	Efficiency
Periods 1–3	96,4%
Periods 6–8	99,4%

Distribution of trade prices

Trade prices in the last completed period.



Results by period

Period	Trades	Average price	Efficiency
1	9	168,9	93,6%
2	9	164,8	97,3%
3	9	156,6	98,2%
4	10	154,3	98,2%
5	10	150,9	100,0%
6	11	150,3	100,0%
7	9	149,9	98,2%
8	10	149,9	100,0%

Individual data: Data → Custom export (double_auction). Chat messages: Data → Chat.

Figure 4.3: Report revealed: early versus late periods, price histogram, and table by period (simulated decisions).

4.2 How to read the report

1. Start with the theoretical benchmark: units expected to trade, equilibrium price, and the band of prices consistent with equilibrium. With 22 or more participants these are 11 units at 150 (section 5.1).
2. A period's **efficiency** is the surplus realized (the sum of buyer value minus seller cost over all trades) divided by the maximum possible. It does not depend on prices: an “unfair” price only redistributes surplus. It falls when a unit that should trade does not, or when an extramarginal trader trades.
3. The chart of the average price by period (only with more than one period) shows convergence towards the dashed equilibrium-price line.
4. The early-versus-late table (three and three periods) appears once at least six periods are complete.

5. The histogram uses the prices of the last completed period, in bins of 10; it shows the dispersion the average hides.
6. The table by period collects the number of trades, the average price, and efficiency.

Debrief script

First ask what price the class thinks was reached and how many trades took place. Reveal the price chart. Ask a high-value buyer and a low-cost seller how they traded, without pointing at anyone. Then draw the value and cost ladder with the class and locate the crossing: the class discovered a price nobody knew.

Theory and evidence

5.1 Theoretical benchmarks

Theoretical foundation

Induced values. Smith (1976) shows how the experimenter can control the relevant preferences: if each person earns more the higher their experimental earnings, a buyer with value v behaves as if their willingness to pay were v , and a seller with cost c as if that were their marginal cost. Ordering values from highest to lowest gives market demand; ordering costs from lowest to highest gives supply.

Unit k trades in competitive equilibrium if $v_k \geq c_k$, that is, if $300 - 15(k - 1) \geq 15(k - 1)$, which holds for $k \leq 11$. At $k = 11$ value and cost coincide (150), so that unit generates no surplus: trading 10 or 11 units is equally efficient.

Rank	1	2	3	4	5	6	7	8	9	10	11	12	13
Buyer value	300	285	270	255	240	225	210	195	180	165	150	135	120
Seller cost	0	15	30	45	60	75	90	105	120	135	150	165	180
Surplus of the unit	300	270	240	210	180	150	120	90	60	30	0	–	–

Table 5.1: Value and cost ladder. Units 12 and 13 are extramarginal: their value is below their cost.

Maximum surplus is the sum of the last row: $300 + 270 + \dots + 30 + 0 = 1650$ ECU. At a price of 150, buyers and sellers of ranks 1 to 10 want to trade and those of rank 12 and above do not; at any other price, one side wants to trade more units than the other.

The benchmark depends on how many people are on each side, not on total class size:

Participants	Buyers / sellers	Units	Price band	Maximum surplus
8	4 / 4	4	45–255	1020
12	6 / 6	6	75–225	1350
16	8 / 8	8	105–195	1560
20	10 / 10	10	135–165	1650
22 or more	11 / 11 or more	11	150	1650

With few people per side all units are intramarginal and the band is wide: any price within it is

an equilibrium price, and the report shows its midpoint (150). With 22 or more participants the price is pinned down and extramarginal traders appear, which is what makes efficiency interesting.

Attention

With an odd number of participants *below 22*, the report computes the band from the traded units only and ignores the extra buyer. The true band is narrower and lies at the top: for example, with 21 participants (11 buyers and 10 sellers) the report shows 135–165 and a price of 150, but the buyer with value 150 stays out of the market only if the price is at least 150, so the equilibrium band is 150–165. With 22 or more participants there is no difference. If your group is small and odd, prefer an even number or discuss the band on the board.

5.2 Experimental evidence

[Smith \(1962\)](#) studied the oral double auction with groups of students and induced values and costs: with few buyers and sellers, prices converge towards the competitive equilibrium within a few periods and efficiency is high. [Plott and Smith \(1978\)](#) compared this institution with one in which only one side posts prices and found that the trading rule affects the level of prices and their convergence: the institution is not a neutral detail. [Ketcham et al. \(1984\)](#) find that, compared with markets where sellers post prices (*posted offer*), the double auction yields prices closer to equilibrium and higher efficiency. The surveys by [Davis and Holt \(1993\)](#) and [Holt \(1995\)](#) document this as one of the most robust results in experimental economics. [Holt \(1996\)](#) and [Holt \(2019\)](#) describe classroom versions.

A useful caveat: [Code and Sunder \(1993\)](#) show that, in the double auction, programmed agents that propose random prices but cannot trade at a loss (budget-constrained *zero-intelligence* traders) achieve efficiencies close to those of people. Part of the efficiency comes from the market rules, not from the sophistication of the participants. These agents, however, do not reproduce the price convergence that people display; [Brewer et al. \(2002\)](#) document this in markets where values and costs are replenished during the period. Since this platform also blocks loss-making trades, high efficiency in your class does not by itself show that students “found” the equilibrium: look at prices too.

5.3 Regularities worth discussing

- Early prices tend to be away from equilibrium, with high dispersion; the direction of the initial bias varies across sessions.
- With repetition, the average price moves towards equilibrium and dispersion falls.
- Efficiency tends to be high from the first period; losses come from intramarginal units that do not trade or from trades by extramarginal participants.
- High-value buyers and low-cost sellers capture most of the surplus; extramarginal traders earn 0, and that is correct.

Attention

Results from one class are descriptive. One market per session is a single independent observation: periods of the same market are not independent of each other. Without random assignment across treatments and several sessions, a difference between two classes does not estimate a causal effect. ECU are not converted into money, so control over preferences is weaker than in a paid experiment.

Baseline modes

Both baseline modes use the same market, without chat, with 180-second periods.

6.1 One period

`double_auction_en_1_period` is enough to show price discovery in a short class. There is no trend chart: the report shows the benchmark, efficiency, the histogram, and the table for the single period. Expect more dispersion than in a late period.

6.2 Eight periods

`double_auction_en_8_periods` repeats the market with the same roles and values. It shows price convergence and allows comparing efficiency in the first three and last three periods. Do not announce average prices between periods: the list of trades of each period is already public to everyone.

Extended variants

7.1 Treatment map

Variant	What changes	Teaching question
Communication	60-second chat for the whole group before each period; eight periods	Can sellers (or buyers) move the price if they agree? Are agreements kept?

7.2 Communication

`double_auction_extended_communication` is identical to the eight-period mode, but before each period everyone can write to each other for 60 seconds in a common chat. All messages appear as “Participant”, without distinguishing roles or people. Nothing written is binding. Anyone who clicks **Go to trading** early waits for the rest; the market opens when everyone arrives or when chat time runs out.

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Time left to complete this page: 0:56

Messages Period 1 of 8

You can write to the whole group. You have 60 seconds. Do not write your name or any personal information.

Participant: Anyone selling below 170?
 Participant: I will sell at 165.
 Participant: Let us wait, there is still time.

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Figure 7.1: Chat before trading (demo messages).

Because the chat is public, buyers also read any attempt at an agreement among sellers, and during trading each seller can offer a price below the agreed one. [Isaac and Plott \(1981\)](#) studied seller conspiracies in double-auction markets and found that the opportunity to conspire does not ensure persistently high prices. Treat the direction of the effect in your class as an open question.

Debrief script

Compare the price path with a session without chat, if you have one. Read aloud, without identifying anyone, some messages (**Data** → **Chat**) and ask whether the agreements were kept. Discuss why, in a market with many sellers and public offers, each one has an incentive to break the agreement.

Class plan and interpretation

8.1 Suggested 50-minute session

0–5 min	Room access and lab rules.
5–10 min	Instructions, example, and comprehension check.
10–35 min	Six to eight periods (with 180 s per period, eight periods take about 30 minutes; with 120 s, about 20). Do not reveal the report between periods.
35–38 min	Class predictions: price and number of trades.
38–45 min	Report: price path, efficiency, histogram. Value and cost ladder on the board.
45–50 min	Published evidence and applications: stock exchanges, electricity auctions, wholesale markets.

8.2 Discussion questions

1. Nobody knew supply or demand. How did the market reach a price close to 150?
2. Who did not trade? Why is it efficient for a buyer with value 135 not to buy?
3. If a buyer with value 135 buys from a seller with cost 15, both gain. Why does that reduce market efficiency?
4. Did your strategy change between the first and the last period? Did you wait for offers to fall (or rise)?
5. The platform did not allow loss-making trades. How much of the efficiency is due to that rule and how much to you?
6. Which real markets work like this: stock exchanges, currency markets, wholesale auctions?

8.3 Common misreadings

Hasty reading	Correction
Those who did not trade lost.	They earned 0. If their value was low or their cost high, not trading was efficient.

Hasty reading	Correction
A price closer to 150 means higher efficiency.	Efficiency depends on <i>who</i> trades, not on the price. The price only splits the surplus.
More trades are better.	Trades by extramarginal participants reduce efficiency even though both parties gain.
Convergence proves students computed the equilibrium.	Nobody knew the ladder; convergence comes from the rules and from learning. Agents that bid at random without losses achieve high efficiency, though not price convergence.
The average describes every period.	Look at the histogram and the table: early periods tend to be dispersed.
A difference between two classes is causal.	Each session is a single market; several sessions and comparable assignment are needed.

Operations, privacy, and troubleshooting

9.1 Privacy and conduct

- Do not ask for names, student IDs, or demographic information during this activity.
- Project the aggregate report. Keep codes, roles, values, and individual screens private.
- Ask students not to write personal information in the chat; the screen itself reminds them.
- Do not use the session to grade anyone on their earnings: they depend on a randomly assigned rank.
- Treat the session as a teaching activity, unless there is a research protocol with specific consent.

9.2 Common problems

Situation	Action
I went to <code>teaching.beer-lab.org</code> and cannot see how to create the session	That is the students' page. Use <code>teaching-admin.beer-lab.org</code> → Open panel .
The panel asks for a username and password	Username admin and the lab's password. If you do not have it, write to <code>lab.economia@servicios.tec.mx</code> .
"Por favor espere" (please wait) before starting	You have not yet created the session in that room, or the student opened another room (another language or edition). Once you create it, they get in automatically.
"Please wait" before trading, for a long time	Check Monitor : someone has not finished the check or has not clicked Next period . If they got disconnected, ask them to reopen the room in the same browser; if they cannot, use Advance slowest participants (at most 20 per click).
"La sesión está llena" (the session is full)	More students joined than were declared. Before starting: Close this room , a new session with the correct number, and everyone opens the link again.
Trading never starts	More participants were declared than joined. Close the room and create a new session with the correct number.
"Please wait" at the end of the period	Normal: the period lasts the configured time for the whole group, even if no more trades occur.
A student says their offer "does not go in"	The improvement rule: a bid must be higher than the current best bid (an ask lower than the best ask), and cannot exceed one's value or fall below one's cost. The red message explains this for a few seconds.
"That offer is no longer available"	Someone else accepted first. It is part of the game.
Several tabs of the same browser are the same participant	Normal with the room link. Use Demo to rehearse.
Not Found on a <code>/p/...</code> link	The individual link belongs to an earlier session. Share the room again (link or QR code), not the individual link.
I want to see a session from another day	Panel → Sessions → the session → Report or Data .
Report without data	The first period has not ended yet. Wait and click Refresh .

9.3 Data for later analysis

Data → **Custom export (double_auction)** gives one row per participant and period: session, anonymous code, period, language, edition, treatment, chat, role, rank, value or cost, whether they traded, price, earnings, and comprehension attempts. Chat messages are under **Data** → **Chat**. The export does not include the order of trades within a period or offers that were not accepted: the platform does not store the order book. Treat periods of the same session as dependent.

Annotated bibliography

- [Smith \(1962\)](#): the founding double-auction experiment and convergence to competitive equilibrium.
- [Smith \(1976\)](#): induced value theory.
- [Plott and Smith \(1978\)](#): comparison of exchange institutions.
- [Isaac and Plott \(1981\)](#): the opportunity to conspire in experimental markets.
- [Ketcham et al. \(1984\)](#): posted offer versus double auction.
- [Gode and Sunder \(1993\)](#): zero-intelligence agents and the efficiency of market rules.
- [Brewer et al. \(2002\)](#): human convergence versus random agents.
- [Davis and Holt \(1993\)](#) and [Holt \(1995\)](#): reference surveys.
- [Holt \(1996\)](#) and [Holt \(2019\)](#): experimental markets for the classroom.

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Room QR codes

Project or print the page of the room you will use. Students scan it with their phone camera and click **Start**.

Continuous Double Auction

English room



`doubleauction.beer-lab.org/room/double_auction_en`

Scan the code and press **Start**.

Continuous Double Auction

English room, extended version



`doubleauction.beer-lab.org/room/double_auction_extended`

Scan the code and press **Start**.

Continuous Double Auction

Sala en español



`doubleauction.beer-lab.org/room/double_auction_es`

Escanee el código y pulse **Comenzar**.

Continuous Double Auction

Sala en español, versión extendida



`doubleauction.beer-lab.org/room/double_auction_extendido`

Escanee el código y pulse **Comenzar**.