



Teacher guide for the multi-unit permit auction game

Lab implementation, theoretical background,
experimental evidence and variants

Behavioral and Experimental Economics Research Lab
Department of Economics



Version 1.0 | October 2026

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

How to use this guide

This guide lets you prepare, run and discuss the **multi-unit permit auction** game developed for the Behavioral and Experimental Economics Research Lab (BEER Lab) at the Department of Economics, Tecnológico de Monterrey. It is written for instructors of intermediate microeconomics, industrial organization and environmental economics, with or without prior experience in experimental economics.

The game is a teaching adaptation of Charles Holt’s classroom versions (the Veconlab “Emissions Permits” and “Multi-Unit Auctions” programs) and of the experimental work with which Holt and coauthors helped design the CO₂ allowance auctions of the US Regional Greenhouse Gas Initiative (RGGI) (Holt et al., 2007; Goeree et al., 2010). It follows the mechanics and parameters of those designs; the wording of the screens and of this guide is our own.

The **quick-start chapter** gets a session running. The operational chapters explain every screen. The conceptual chapters give the theoretical background and evidence needed to interpret results. Shared rules are explained once; each format and variant lists only what changes relative to the basic game (uniform price).

Author

This guide was prepared by Edgar O. Castro Méndez, research professor at the Department of Economics, Tecnológico de Monterrey, Monterrey campus. For questions or suggestions about its content, contact the author at ecastrom@tec.mx.

For the instructor

This guide matches the English interface. A separate Spanish version exists. Screenshots in this guide were taken on a local instance of the game with simulated decisions; the numbers shown illustrate the interface and are *not* results from a real class. Project only aggregate results: never link participant codes to names, student IDs, seats or individual decisions.

This game is still being prepared for the lab server. The access steps in Chapter 2 and the screen sequence in Chapter 3 are already final (tested on an identical copy of the game); only the screenshots of YOUR game’s card, login and rooms on teaching-admin.beer-lab.org and teaching.beer-lab.org are still missing — this guide will add them once the game goes live on those sites.

Contents

How to use this guide	i
1 Quick-start guide	1
1.1 Fact sheet	1
1.2 Minimal sequence	2
1.3 Checklist	2
2 Platform access	3
2.1 Your access: teaching-admin and the game's panel	3
2.2 The panel: minimal vocabulary	4
2.3 Rehearsing before class	5
2.4 Creating the session in class	7
2.5 How your students join	7
3 The basic game and its screens	10
3.1 Rules, incentives and benchmarks	10
3.2 Cover, instructions and comprehension check	11
3.3 Offers and waiting	13
3.4 Result and wrap-up	15
4 Instructor report and debrief	17
4.1 When to reveal	17
4.2 How to read the report	20
5 Theory and evidence	22
5.1 Benchmark: competitive band and demand reduction	22
5.2 Experimental evidence	23
5.3 Regularities worth discussing	23
6 Basic modes	24
6.1 Uniform price, one round	24

6.2	Uniform price, 8 rounds	24
6.3	Pay your bid (discriminatory), 8 rounds	24
7	Extended variants	28
7.1	Ascending clock	28
7.2	Uniform price with chat	34
8	Class plan and reading the results	35
8.1	Suggested 50-minute session	35
8.2	Discussion questions	35
8.3	Common misinterpretations	36
9	Operations, privacy and troubleshooting	37
9.1	Privacy and conduct	37
9.2	If someone disconnects: Advance slowest participants	37
9.3	Common problems	38
9.4	Data for later analysis	38
10	Annotated bibliography	39
A	Room QR codes	41

List of Figures

2.1	Instructor page: teaching-admin.beer-lab.org . Once this game goes live, its card will appear in this same directory (search for Permit auction).	3
2.2	Demo: the game's configurations (six basic and four extended, in Spanish and English).	5
2.3	Rooms: the game's four rooms.	5
2.4	Links for a session (here, the 12-participant session used for the figures). This guide's screenshots were taken on a local copy, which is why the addresses say <code>localhost</code> ; on the server they say <code>permitauktion.beer-lab.org</code> .	6
2.5	Monitor of a session in progress: each participant's round and screen.	6
2.6	Form for the basic English room: only its own three configurations appear.	7
2.7	Room the student opens.	8
2.8	Catalogue at teaching.beer-lab.org , the students' page. Once this game goes live, its card will appear here (search for Permit auction).	9
3.1	Cover page and lab rules.	11
3.2	Instructions for the uniform-price format, for an auction of 6 people.	12
3.3	Comprehension check (uniform price).	13
3.4	Wrong answers: the message restates the rule without giving the answer.	13
3.5	Offer screen, with the offers already typed (simulated decisions).	14
3.6	Increasing offers rejected: the message explains the rule and the fields are empty.	14
3.7	Waiting, while other people in the auction have not yet sent their offers.	15
3.8	Result under uniform price: this person offered 75, 62 and 41 for permits worth 77, 72 and 70; she got two and paid the clearing price, 52, for each, earning $149 - 104 = 45$ (simulated decisions).	15
3.9	End screen: total earnings, round history and a request to wait for the instructor (simulated decisions).	16
4.1	Report with results hidden.	17
4.2	Report revealed: benchmark, summary and price versus the competitive band by round (12 participants, two auctions, 8 uniform-price rounds with simulated decisions).	18
4.3	Report revealed: offer as a percentage of value by unit, overall, by halves and by round (simulated decisions).	19

4.4	Report revealed: first versus last rounds, offer/value histogram for the last round, auctions in the last round and table by round (simulated decisions).	20
6.1	Instructions for the discriminatory auction.	25
6.2	Offers in the discriminatory auction (simulated decisions).	26
6.3	Result in the discriminatory auction: she pays 54 for her one permit; below, the nine winning offers in the auction (simulated decisions).	26
6.4	Report of a discriminatory session: summary and average price paid versus the band (6 participants, 8 rounds, simulated decisions).	27
7.1	Instructions for the ascending clock.	29
7.2	Clock mid-auction, before this person chooses: buttons beyond what is allowed are disabled (simulated decisions).	30
7.3	The same person after choosing: waiting for the others (4 of 6 have answered) (simulated decisions).	31
7.4	Clock result: final quantity, price, earnings and the clock's full path. In this round total demand went from 10 to 8 at the price 60, so one permit went unsold (simulated decisions).	32
7.5	Clock report: summary, final price versus the band and units dropped below value (6 participants, 8 rounds, simulated decisions).	33
7.6	Chat before a round (simulated messages).	34

Quick-start guide

1.1 Fact sheet

Purpose	Show <i>demand reduction</i> : in a uniform-price auction, a bidder who wants several units bids less than her extra units are worth, because those bids can set the price she pays for all of them. Compare with the auction where each winner pays her bid (discriminatory) and with an ascending clock.
Participants	Any number. Fixed auctions of 6, formed at random in round 1; leftover people join the first auctions one at a time ($31 \rightarrow$ four auctions of 6 and one of 7). With fewer than 6, a single smaller auction.
Supply and values	Each auction sells $S = \lfloor 3n/2 \rfloor$ permits per round (9 with 6 people). Each person can use up to 3 permits and receives three whole-number values between 10 and 100 every round, sorted from high to low.
Decision	Sealed bid: up to three whole-number offers from 0 to 150, non-increasing (0 = no bid). Clock: how many permits (0–3) at each price.
Earnings	Sum of the values of the permits obtained minus the amount paid. A person always gets her first permits.
Formats	Uniform price (everyone pays the highest rejected offer); discriminatory (each winning offer pays itself); ascending clock; uniform price with chat.
Duration	5–8 minutes for one round; 15–20 minutes for 8 sealed-bid rounds; 20–30 minutes for 8 clock rounds or rounds with chat, not counting the debrief.
Instructor (you)	teaching-admin.beer-lab.org/en → the game’s card → Open panel . Asks for username and password (section 2.1).
Students	Room link https://permitauction.beer-lab.org/room/permit_auction_en , its QR code (section 2.5) or teaching.beer-lab.org .
Report	Competitive band, price versus the band, efficiency, revenue, offer as a percentage of value by unit (1st, 2nd, 3rd), charts by round, first versus last rounds, offer/value histogram, table of auctions and table by round.

Note

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

1.2 Minimal sequence

Before class

1. Request panel access at lab.economia@servicios.tec.mx, stating the game, course, number of students and date. You will receive the password for the **admin** user.
2. Open teaching-admin.beer-lab.org/en, look for **Permit auction** and click **Open panel**. Enter the username and password.
3. Rehearse in **Demo**: open a configuration and play it in several tabs to see the screens and the report (section 2.3). If you will use the clock, rehearse it: it is the most different format.

In class

4. Count the students present.
5. In the panel, open **Rooms** and the room **[EN] Permit Auction** (or the extended one). Choose the configuration (usually uniform price, 8 rounds), type the *exact* number of students under **Number of participants** and click **Create**.
6. Share the room link or project its QR code. Each student clicks **Start**.
7. In the room, click **Monitor the session**: the session page opens, with the **Monitor** (progress) and **Report** tabs. When done, open **Report**, click **Show results** and lead the discussion.

After class

8. In the room, click **Close this room**. It is then ready for the next group; the session's data are kept under **Sessions**.

1.3 Checklist

- ☐ Panel password received and tested at permitauction.beer-lab.org/login.
- ☐ Rehearsal done in **Demo**, with at least one full round of the format you will use.
- ☐ Computers, internet, browser and projector ready.
- ☐ Format chosen: uniform price (recommended to start), discriminatory, clock or with chat.
- ☐ Number of participants in the session equal to the number of students present.
- ☐ Room link or QR code at hand (section 2.5); tested from a phone.
- ☐ Students told that ECU are experimental units and there is no cash payment.
- ☐ Monitor and report open; the demand-reduction example in section 5.1 ready for the wrap-up.

Platform access

2.1 Your access: teaching-admin and the game's panel

The instructor page is teaching-admin.beer-lab.org/en. It does not appear in the beer-lab.org menu: type the address directly or bookmark it. It lists every classroom game in the lab; you can search by title, topic or JEL code.

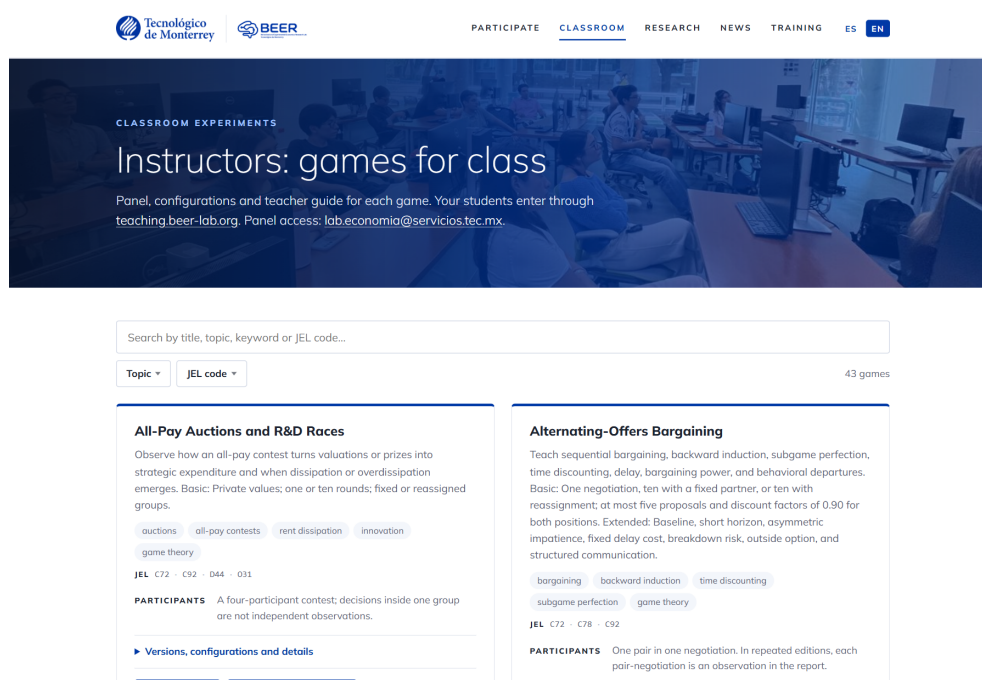


Figure 2.1: Instructor page: teaching-admin.beer-lab.org. Once this game goes live, its card will appear in this same directory (search for **Permit auction**).

Each game has a card with its description, number of participants and duration, and two buttons: **Open panel**, which goes to the game's panel, and **Teacher guide (PDF)**, which downloads this guide. Expanding **Versions, configurations and details** lists the rooms, each with its own **open panel** straight to that room's session-creation form. The game's panel (<https://permitauction.beer-lab.org>) is protected: **Open panel** shows the **Admin Login** screen, where you type **admin** under **Username** and the password the lab gave you under **Password**. If you do not have it, request it at lab.economia@servicios.tec.mx.

Note

This game does not yet have its own card in the directory or an active panel at permitauction.beer-lab.org: it is still being prepared. The procedure above is identical to every other lab game's (see the Cournot, Bertrand and live market guides); once it goes live, this section will be updated with screenshots specific to **Permit auction**.

2.2 The panel: minimal vocabulary

The panel is oTree's own and is in English. These are the only terms you need:

Demo	Practice sessions. Creates a session with fictitious participants that you play yourself across several tabs. Use it to rehearse, never with students.
Rooms	Fixed addresses for class. This game has four: basic and extended, in Spanish and English. Students always enter through a room.
Create / Number of participants	Create the session in the room and declare how many people will play.
Monitor	A table with each participant's round and screen. It does not show decisions.
Advance slowest participants	The Monitor button that moves along whoever has fallen behind. In the clock it has important side effects (section 9.2).
Report	The instructor report for projecting aggregate results.
Data	Downloads the data as CSV.
Sessions	A list of all your sessions, to return to an earlier one.
Close this room	Frees the room when done, for the next group.

In this panel, **Demo** shows only this game's ten configurations and **Rooms** only its four rooms. Inside each room, the session-creation form filters further: the basic English room ([EN] **Permit Auction**) only offers the three basic English configurations (uniform price with one round, uniform price with 8 rounds and discriminatory with 8 rounds); the extended English room only offers the two extended ones (ascending clock and uniform price with chat). If a different game appears, do not start the session and notify the lab.

oTree Demo Sessions Rooms Data Server Check

Demo

[ES] Subasta de permisos — precio uniforme, una ronda
[ES] Subasta de permisos — precio uniforme, 8 rondas
[ES] Subasta de permisos — cada quien paga su oferta (discriminatoria), 8 rondas
[EN] Permit auction — uniform price, one round
[EN] Permit auction — uniform price, 8 rounds
[EN] Permit auction — pay your bid (discriminatory), 8 rounds
[ES] Subasta de permisos extendido — reloj ascendente, 8 rondas
[ES] Subasta de permisos extendido — precio uniforme con chat, 8 rondas
[EN] Permit auction extended — ascending clock, 8 rounds
[EN] Permit auction extended — uniform price with chat, 8 rounds

**Juegos de mercados /
Market games**
 — BEER Lab
 Subasta de permisos /
 Permit auction

Figure 2.2: Demo: the game's configurations (six basic and four extended, in Spanish and English).

oTree Demo Sessions Rooms Data Server Check

Rooms

Current rooms:

[ES] Subasta de permisos
[EN] Permit Auction
[ES] Subasta de permisos — extendido
[EN] Permit Auction — extended

Figure 2.3: Rooms: the game's four rooms.

2.3 Rehearsing before class

In **Demo**, click a configuration: a practice session with six participants (one full auction) is created and the links page appears. Open each **P1**, **P2**, ... link in a separate tab and play as if you were each student; then open **Report**. These sessions do not affect your classes. To rehearse the clock, keep the six tabs in view: each price lasts up to 20 seconds and moves on as soon as all six people have answered.

oTree Demo Sessions Rooms Data Server Check

[EN] Permit auction — uniform price, 8 rounds: session 'yehiyznx'

Edit Links Monitor Data Payments Report Description

You can either use the session-wide link, persistent links, or single-use links.

Session-wide link

If it's not practical for you to use a Room, you can distribute the following link to participants.

<http://localhost:8042/join/biburako>

Persistent links

For a real session, you should use a [room](#).

Single-use links

Below are single-use links.

P1	http://localhost:8042/InitializeParticipant/8lyw3p5u
P2	http://localhost:8042/InitializeParticipant/xf0vsl5
P3	http://localhost:8042/InitializeParticipant/ezq35p23
P4	http://localhost:8042/InitializeParticipant/68t0veou
P5	http://localhost:8042/InitializeParticipant/xd80k3w
P6	http://localhost:8042/InitializeParticipant/u2vgjw0k
P7	http://localhost:8042/InitializeParticipant/qrz2eyxq
P8	http://localhost:8042/InitializeParticipant/fz1zb6kr
P9	http://localhost:8042/InitializeParticipant/f7fqojw4
P10	http://localhost:8042/InitializeParticipant/3eaq0t39
P11	http://localhost:8042/InitializeParticipant/0767edub
P12	http://localhost:8042/InitializeParticipant/duapi6bm

Figure 2.4: Links for a session (here, the 12-participant session used for the figures). This guide's screenshots were taken on a local copy, which is why the addresses say `localhost`; on the server they say `permitauction.beer-lab.org`.

Note

Do not rehearse with the room link open in several tabs of the same browser: oTree recognizes the browser, and every tab would count as the same person. Use **Demo** to rehearse instead.

oTree Demo Sessions Rooms Data Server Check

[EN] Permit auction — uniform price, 8 rounds: session 'yehiyznx'

Edit Links Monitor Data Payments Report Description

ID	Code	Label	Progress	App	Round	PageName	Waiting	WaitsFor	Since
P1	8lyw3p5u		43/88	permit_auction	4	RoundResult			1m
P2	xf0vsl5		43/88	permit_auction	4	RoundResult			1m
P3	ezq35p23		43/88	permit_auction	4	RoundResult			1m
P4	68t0veou		43/88	permit_auction	4	RoundResult			1m
P5	xd80k3w		43/88	permit_auction	4	RoundResult			1m
P6	u2vgjw0k		43/88	permit_auction	4	RoundResult			1m
P7	qrz2eyxq		43/88	permit_auction	4	RoundResult			1m
P8	fz1zb6kr		43/88	permit_auction	4	RoundResult			1m
P9	f7fqojw4		43/88	permit_auction	4	RoundResult			1m
P10	3eaq0t39		43/88	permit_auction	4	RoundResult			1m
P11	0767edub		43/88	permit_auction	4	RoundResult			1m
P12	duapi6bm		43/88	permit_auction	4	RoundResult			1m

Figure 2.5: Monitor of a session in progress: each participant's round and screen.

2.4 Creating the session in class

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

The screenshot shows the oTree web interface. At the top is a dark navigation bar with links: oTree, Demo, Sessions, Rooms, Data, and Server Check. Below this, the page title is "Room: [EN] Permit Auction". Underneath is the 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." Below this box, there is a "Session Config" section with a dropdown menu showing "[EN] Permit auction — uniform price, one round". Underneath the dropdown is a "Number of participants" input field, which is currently empty. Below the input field, it says "Must be a multiple of 1". At the bottom of this section is a blue "Create" button. Below the "Create" button is a link "Configure session" with a gear icon. At the very bottom of the form is the text "App sequence".

Figure 2.6: Form for the basic English room: only its own three configurations appear.

Note

Declare the exact number, with no spare seats. Auctions are formed at random when the session is created and kept for every round; each round of an auction waits for all of its members to decide. If one more student than declared arrives, they will see a “session is full” message (currently shown in Spanish, “La sesión está llena”, on English rooms too); in that case, before starting, click **Close this room**, create another session with the correct number, and ask the class to reopen the link or the QR code. If you declare more people than actually join, the auction with empty seats never finishes its first round.

2.5 How your students join

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

1. **QR code.** Project the one for the room you are using (below, and full-size in appendix A). They scan it with a phone camera.
2. **Room link.** Share it over the class chat or on Canvas: https://permitauction.beer-lab.org/room/permit_auction_en.
3. **Catalogue.** At teaching.beer-lab.org they search for **Permit auction** and click their language's button (once the game is live).



English, basic
[permिताuction.beer-lab.org/room/
permit_auction_en](https://permिताuction.beer-lab.org/room/permit_auction_en)



English, extended
[permिताuction.beer-lab.org/room/
permit_auction_extended](https://permिताuction.beer-lab.org/room/permit_auction_extended)



Español, básica
[permिताuction.beer-lab.org/room/
permit_auction_es](https://permिताuction.beer-lab.org/room/permit_auction_es)



Español, extendida
[permिताuction.beer-lab.org/room/
permit_auction_extendido](https://permिताuction.beer-lab.org/room/permit_auction_extendido)

What the participant sees

The student opens the room and clicks **Start**. If you have not created the session yet, they see a waiting page and join as soon as you do; so you can share the link or QR code from the start of class. No email or password is needed: they receive an anonymous code.

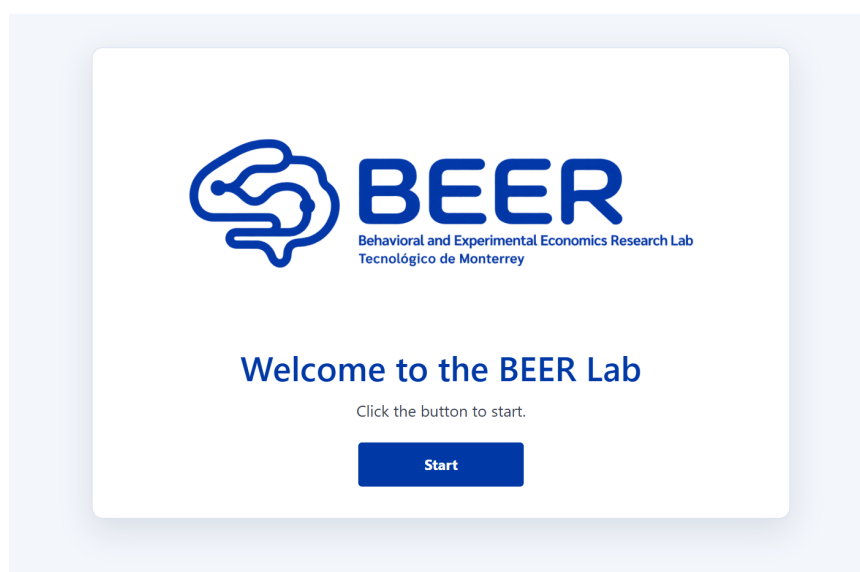


Figure 2.7: Room the student opens.

Language is set per room: a session created in the English room only admits students entering through the English room. If your group is mixed, pick one language for everyone.

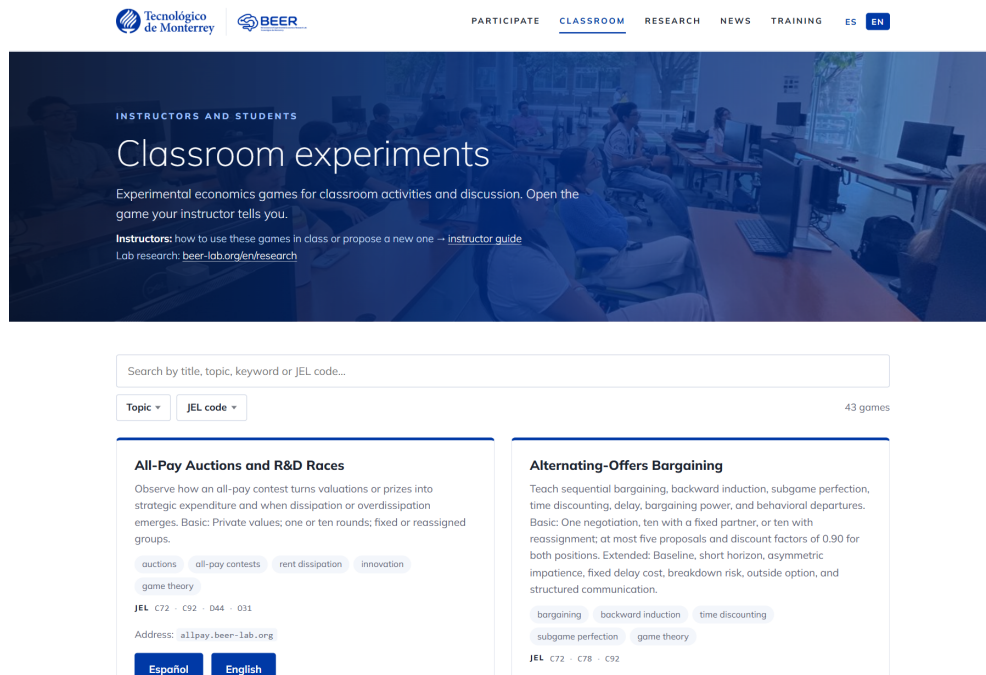


Figure 2.8: Catalogue at teaching.beer-lab.org, the students' page. Once this game goes live, its card will appear here (search for **Permit auction**).

The basic game and its screens

3.1 Rules, incentives and benchmarks

Auctions. When the session is created, the class is split at random into fixed auctions of 6; they are the same people in every round, and the instructions say so. If the class does not divide evenly by 6, the remaining people join the first auctions one at a time: with 31 students there are four auctions of 6 and one of 7; with 35, five of 7. With fewer than 6 participants a single smaller auction is formed. Each student reads the actual size of her auction and the number of permits it sells in her instructions.

Permit supply. An auction of n people sells $S = \lfloor 3n/2 \rfloor$ permits per round: 9 with 6 people, 10 with 7, 3 with 2, and 1 with a single person. Since each person can use up to 3, maximum demand ($3n$) is twice the supply: permits are scarce.

Values. Every round, each person receives three whole-number values drawn uniformly between 10 and 100 and sorted from high to low: the first permit is the most valuable. Values are private and new every round. Earnings for the round are

$$\pi_i = \sum_{k=1}^{q_i} v_{ik} - \text{payment}_i,$$

where q_i is the number of permits obtained; a person who gets k permits always gets her first k (the most valuable).

Uniform price (basic format). Each person sends, without seeing the others, up to three whole-number offers between 0 and 150, one per permit, non-increasing ($b_1 \geq b_2 \geq b_3$); 0 means no bid for that permit. All positive offers in the auction are ranked and the S highest get one permit each (ties are broken at random). *Every* permit is paid at the same price: the highest offer that did not get a permit (the $(S + 1)$ -th); if there are S positive offers or fewer, the price is 0. Offers may exceed the value (up to 150), so overbidding stays visible.

For the instructor

Before playing, ask the class: if you want two permits and the price is set by the highest *losing* offer, should you offer for your second permit what it is worth to you? Few people see right away that their own offer for the second permit may be the one that sets the price of their first. The game makes it visible.

3.2 Cover, instructions and comprehension check

The cover page introduces the BEER Lab and the rules of conduct. The instructions describe only the action: the size of the auction, the values, the earnings rule, the format's selling and pricing rule and a numerical example. They never mention “demand reduction”, “emissions”, “collusion”, “efficiency” or “competitive price”, and they suggest no bidding rule.





Behavioral and Experimental Economics Research Lab

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 an activity where you buy permits. Your earnings depend on your decisions, on other people's decisions and partly on chance.

During the session

- Do not talk or communicate with other people.
- 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

Round 1 of 8

In each round, **9 permits** are sold in an auction. Your auction has **6 people** (you and 5 others). They are the same people in every round.

Your values

Each permit lets you produce one unit. You can use up to 3 permits. At the start of each round you receive three values, one per permit: **the first permit has the highest value; the second is worth the same as or less than the first, and the third the same as or less than the second.**

Each value is a whole number between 10 and 100; every number is equally likely. They are drawn again every round and sorted from high to low. The other people's values are drawn the same way, and only each person knows their own.

Your earnings in the round = the sum of the values of the permits you get – what you pay for them. If you get one permit, it is the first; if you get two, the first and the second.

How permits are sold

Each person sends, without seeing the others, up to 3 offers: one for their first permit, one for the second and one for the third. Each offer is a whole number between 0 and 150 ECU. The offer for the second permit cannot be higher than the offer for the first, nor the third higher than the second. An offer of 0 means you do not bid for that permit.

All offers in the auction are ranked from highest to lowest. The 9 highest offers get one permit each. A tie for the last place is decided at random.

Price: every permit sold is paid at the same price, equal to the highest offer that did **not** get a permit. If there are 9 positive offers or fewer, they all get a permit and the price is 0.

Example: your values are 80, 55 and 30, and you offer 70, 60 and 20. If your first two offers get a permit and the highest offer that did not get one is 42, you pay 42 for each: you earn $80 + 55 - 2 \times 42 = 135 - 84 = 51$ ECU.

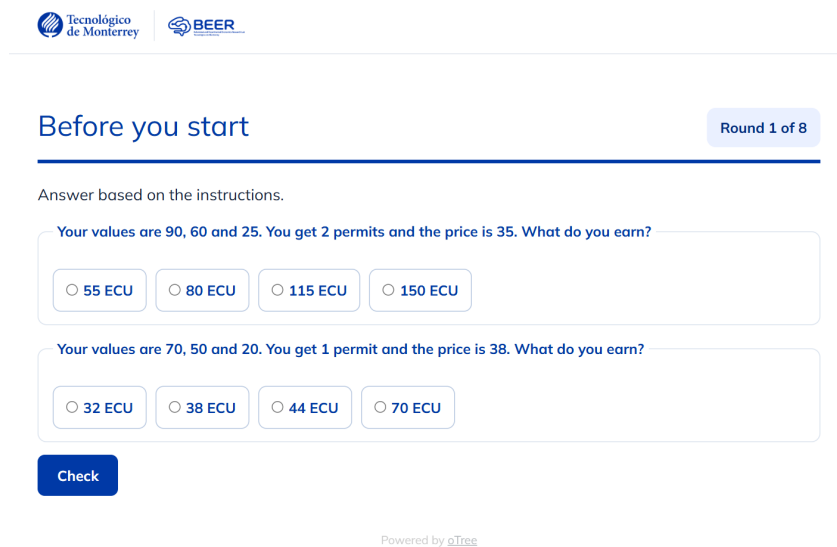
- Your earnings in a round can be negative if you pay more for a permit than it is worth.
- Auctions are formed with 6 people; when the class does not divide evenly, the remaining people join the first auctions, which then sell more permits (3 for every 2 people, rounded down). With fewer than 6 participants, a single smaller auction is formed.
- There will be 8 rounds. Your earnings from all rounds are added up.
- Amounts are in ECU (experimental currency units). There is no cash payment.

Continue

Powered by [oTree](#)

Figure 3.2: Instructions for the uniform-price format, for an auction of 6 people.

The example uses values 80, 55 and 30 and offers 70, 60 and 20 (one below value, one above, one far below, so as not to suggest a rule): at a price of 42 the person gets two permits and earns $135 - 84 = 51$ ECU. The check asks two questions with other numbers: values 90, 60, 25, two permits at 35 (earnings 80) and values 70, 50, 20, one permit at 38 (earnings 32). In the discriminatory auction and the clock the questions adapt to the payment rule. After a mistake, the message restates the rule without giving the answer and lets the student try again. No number in the instructions is any auction's competitive band: values are random.



Tecnológico de Monterrey | BEER

Before you start

Round 1 of 8

Answer based on the instructions.

Your values are 90, 60 and 25. You get 2 permits and the price is 35. What do you earn?

☐ 55 ECU
 ☐ 80 ECU
 ☐ 115 ECU
 ☐ 150 ECU

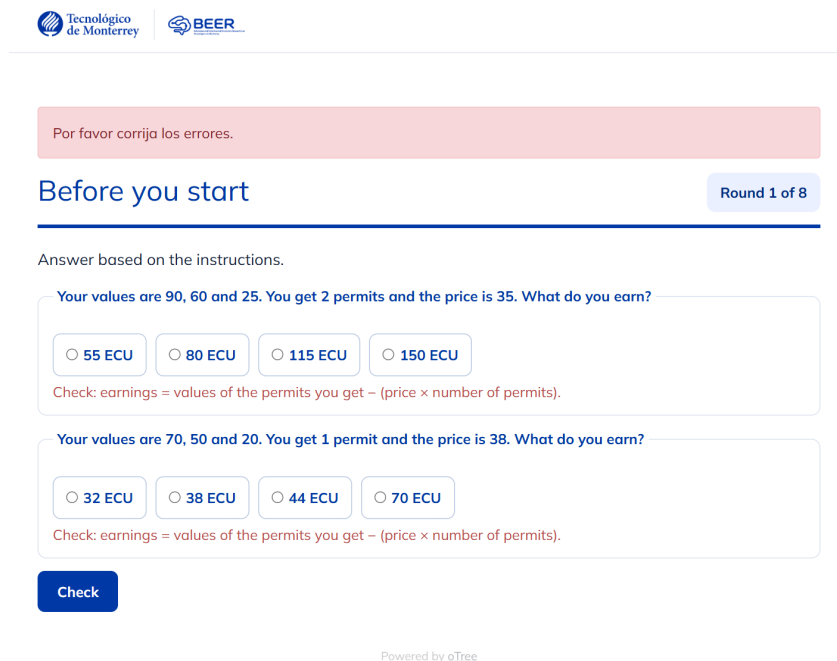
Your values are 70, 50 and 20. You get 1 permit and the price is 38. What do you earn?

☐ 32 ECU
 ☐ 38 ECU
 ☐ 44 ECU
 ☐ 70 ECU

Check

Powered by oTree

Figure 3.3: Comprehension check (uniform price).



Tecnológico de Monterrey | BEER

Por favor corrija los errores.

Before you start

Round 1 of 8

Answer based on the instructions.

Your values are 90, 60 and 25. You get 2 permits and the price is 35. What do you earn?

☐ 55 ECU
 ☐ 80 ECU
 ☐ 115 ECU
 ☐ 150 ECU

Check: earnings = values of the permits you get - (price × number of permits).

Your values are 70, 50 and 20. You get 1 permit and the price is 38. What do you earn?

☐ 32 ECU
 ☐ 38 ECU
 ☐ 44 ECU
 ☐ 70 ECU

Check: earnings = values of the permits you get - (price × number of permits).

Check

Powered by oTree

Figure 3.4: Wrong answers: the message restates the rule without giving the answer.

3.3 Offers and waiting

Each person sees her three values and types her three offers. The screen recalls how many permits are sold and how many people are in her auction.




The offer for a permit cannot be higher than the offer for the previous permit (offer 1 $\geq$ offer 2 $\geq$ offer 3).

Your offers

Round 1 of 8

9 permits are sold in your auction (6 people).

Permit	Your value	Your offer (0 to 150)
1	85	85
2	77	68
3	17	11

Offer 1 $\geq$ offer 2 $\geq$ offer 3. Enter 0 if you do not bid for a permit.

Send offers

Powered by [oTree](#)

Figure 3.5: Offer screen, with the offers already typed (simulated decisions).

If the offers are not whole numbers from 0 to 150, or an offer is higher than the one for the previous permit, a message appears and the person must type *all three* offers again: the fields are cleared.




The offer for a permit cannot be higher than the offer for the previous permit (offer 1 $\geq$ offer 2 $\geq$ offer 3).

Your offers

Round 1 of 8

9 permits are sold in your auction (6 people).

Permit	Your value	Your offer (0 to 150)
1	85	
2	77	
3	17	

Offer 1 $\geq$ offer 2 $\geq$ offer 3. Enter 0 if you do not bid for a permit.

Send offers

Powered by [oTree](#)

Figure 3.6: Increasing offers rejected: the message explains the rule and the fields are empty.

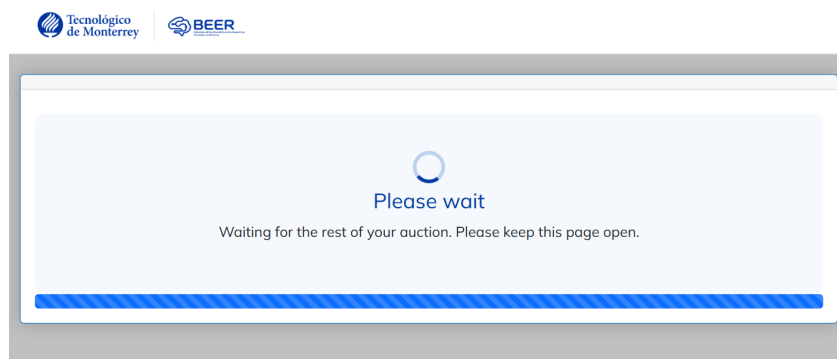


Figure 3.7: Waiting, while other people in the auction have not yet sent their offers.

What the participant sees

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

3.4 Result and wrap-up

The result shows the person’s values and offers, how many permits she got, the price per permit, the total paid, earnings for the round and cumulative earnings, and how many permits were sold in her auction. It does not show other people’s offers. Negative earnings appear in red.

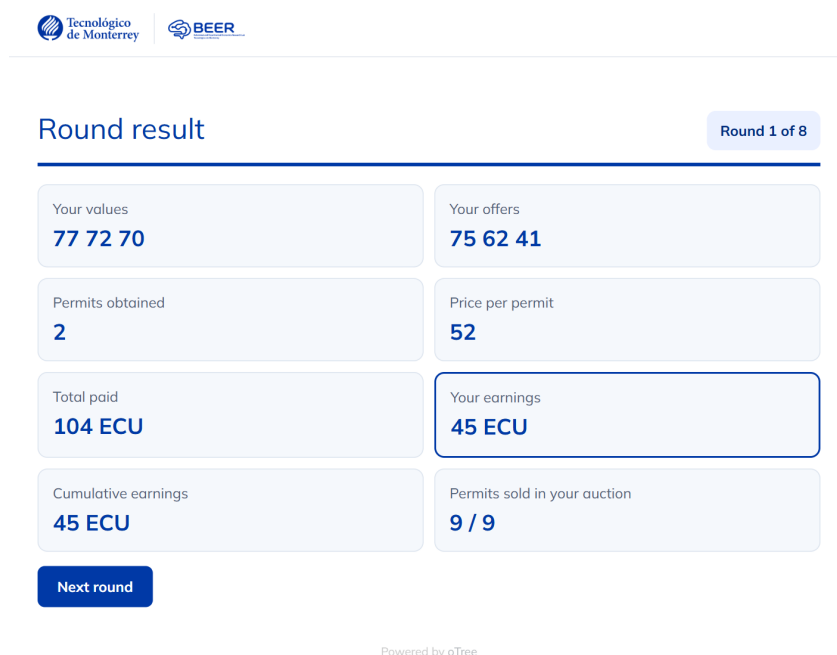


Figure 3.8: Result under uniform price: this person offered 75, 62 and 41 for permits worth 77, 72 and 70; she got two and paid the clearing price, 52, for each, earning $149 - 104 = 45$ (simulated decisions).

End of the activity

Round 8 of 8

Your total earnings

413 ECU

Round	Values	Offers	Permits	Price	Paid	Earnings
1	85 · 77 · 17	85 · 68 · 11	2	50	100	62
2	72 · 35 · 14	72 · 30 · 8	1	33	33	39
3	79 · 56 · 13	79 · 45 · 7	2	44	88	47
4	79 · 59 · 17	79 · 46 · 8	1	46	46	33
5	90 · 86 · 71	90 · 63 · 31	2	33	66	110
6	41 · 15 · 11	41 · 11 · 4	1	33	33	8
7	99 · 82 · 72	99 · 55 · 25	2	53	106	75
8	84 · 19 · 13	84 · 12 · 4	1	45	45	39

Thank you for taking part. Please wait for the instructor.

Powered by [oTree](#)

Figure 3.9: End screen: total earnings, round history and a request to wait for the instructor (simulated decisions).

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 is over. It opens with results hidden. The top shows participants, number and size of auctions, permits per auction and completed rounds, so you can project it from the start without giving anything away. Click **Show results** when the current round ends; **Refresh** adds new rounds and **Hide results** covers them again. (The English report currently uses decimal commas.)

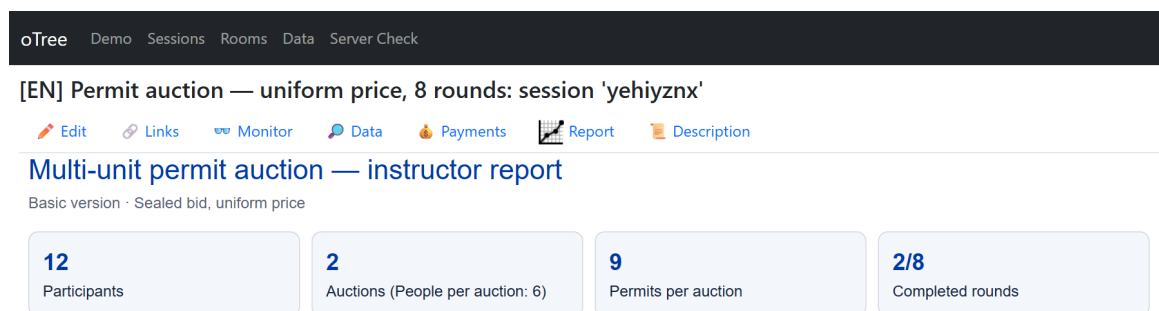


Figure 4.1: Report with results hidden.

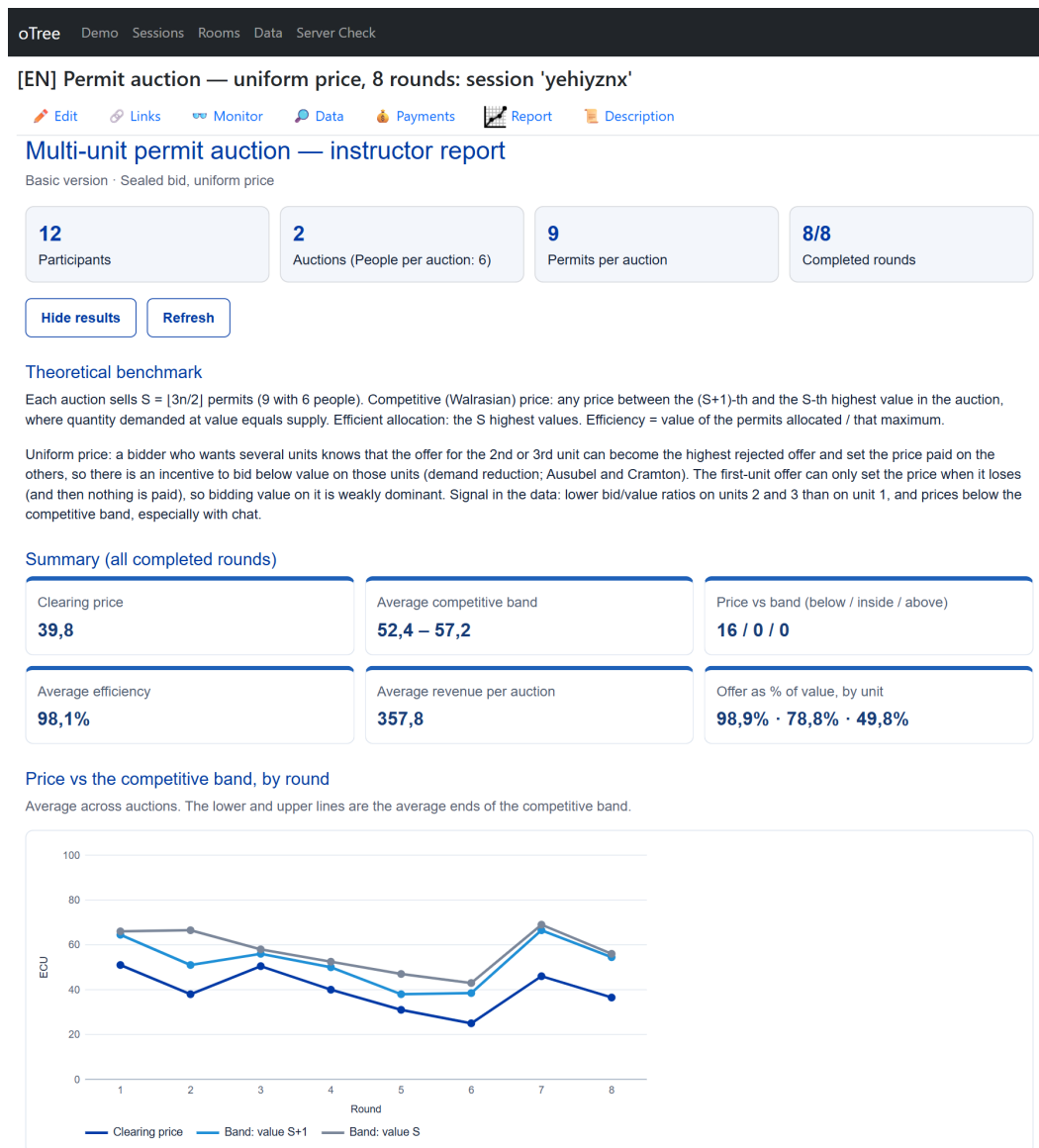


Figure 4.2: Report revealed: benchmark, summary and price versus the competitive band by round (12 participants, two auctions, 8 uniform-price rounds with simulated decisions).

Offer as % of value, by unit

Average offer/value $\times 100$ for each person's 1st, 2nd and 3rd permit (an offer of 0 counts as 0%). Under uniform price, demand reduction shows up as lower ratios on units 2 and 3.

	Unit 1	Unit 2	Unit 3
Summary (all completed rounds)	98,9%	78,8%	49,8%
Rounds 1–4	99,1%	84,2%	59,2%
Rounds 5–8	98,8%	73,5%	40,4%

By unit and by round

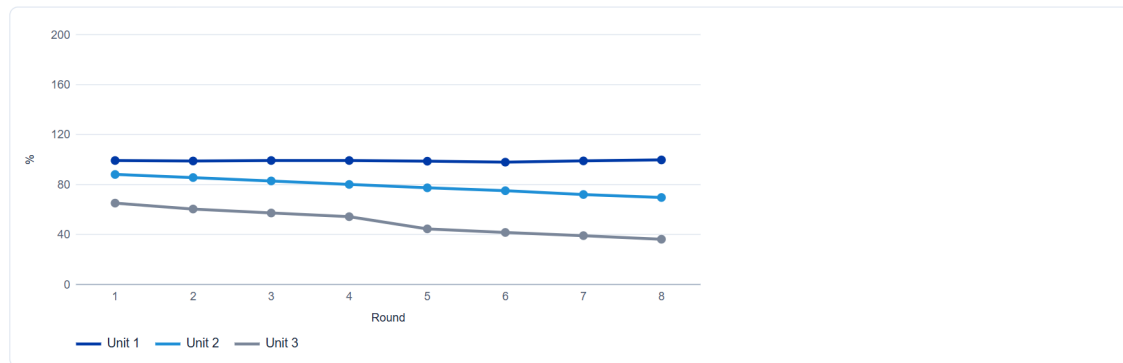


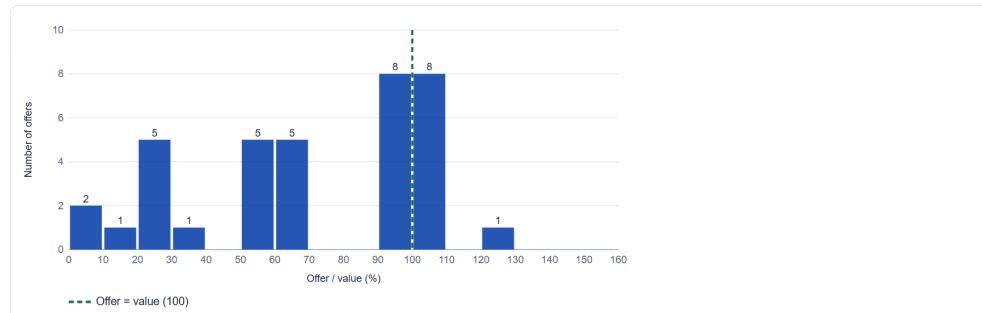
Figure 4.3: Report revealed: offer as a percentage of value by unit, overall, by halves and by round (simulated decisions).

First rounds vs last rounds

	Clearing price	Average competitive band	Average efficiency	Average revenue per auction
Rounds 1–4	44,9	55,4 – 60,8	98,4%	403,9
Rounds 5–8	34,6	49,4 – 53,8	97,8%	311,6

Distribution of offer/value

All offers in the last completed round, as % of the value of that permit (160% or more is grouped in the last bar).



Auctions in the last completed round (Round 8)

Auction	People	Permits	Sold	Clearing price	Band	Revenue	Efficiency (%)
1	6	9	9	45	69 – 71	405	97,3
2	6	9	9	28	40 – 41	252	99,8

Results by round

Round	Auctions	Clearing price	Band	Revenue	Efficiency (%)	Unit 1	Unit 2	Unit 3
1	2	51	64,5 – 66	459	98,1	99,2%	88,1%	65,1%
2	2	38	51 – 66,5	342	97,5	98,8%	85,6%	60,4%
3	2	50,5	56 – 58	454,5	99,3	99,2%	82,9%	57,2%
4	2	40	50 – 52,5	360	98,6	99,2%	80,1%	54,3%
5	2	31	38 – 47	279	97,8	98,7%	77,4%	44,5%
6	2	25	38,5 – 43	225	96,1	97,9%	75,0%	41,6%
7	2	46	66,5 – 69	414	98,7	98,9%	72,0%	39,1%
8	2	36,5	54,5 – 56	328,5	98,6	99,7%	69,6%	36,2%

Individual data: Data → Custom export (permit_auction). Design: Holt (Veconlab, "Emissions Permits" and "Multi-Unit Auctions"); Goeree, Holt, Palmer, Shobe and Burtraw (2010).

Figure 4.4: Report revealed: first versus last rounds, offer/value histogram for the last round, auctions in the last round and table by round (simulated decisions).

4.2 How to read the report

1. The **benchmark** defines the competitive band (between the $(S + 1)$ -th and the S -th highest value in each auction) and efficiency, and summarizes what the session's format predicts.
2. The **summary** gives the average clearing price (in the discriminatory auction, the average price paid per permit; in the clock, the final price), the average band, how many auction-rounds closed below, inside or above their band, average efficiency, average revenue per auction, and the average offer as a percentage of value for the 1st, 2nd and 3rd permit.
3. The **price chart** compares, round by round, the average price with the average ends of the band. A price consistently below the band is the footprint of demand reduction.
4. **Offer as % of value, by unit** is the central measure. If the class reduces demand, the ratio is close to 100% on unit 1 and clearly lower on units 2 and 3. An offer of 0 counts as 0%. The table also compares rounds 1–4 with 5–8, and the chart shows the path by round.

5. The **histogram** collects every offer in the last completed round as a percentage of that permit's value, with a line at 100%. The table of **auctions in the last round** shows differences across auctions; the **table by round** gathers everything without identifying anyone.

For the instructor

In the simulated session in the figures (12 participants in two auctions of 6, 8 uniform-price rounds; *scripted* decisions for illustration, not results from a class), the average clearing price was 39.8 against an average competitive band of 52.4–57.2; all 16 auction-rounds closed below their band. Offers averaged 98.9%, 78.8% and 49.8% of value on units 1, 2 and 3, and on units 2 and 3 they fell from rounds 1–4 to rounds 5–8 (from 84.2% to 73.5% and from 59.2% to 40.4%). Average efficiency was 98.1%. The script had almost everyone bid close to value on the first permit and less and less on the second and third; two people bid their values on all three permits and one bid above value on the first. The values were drawn by the game. In your class the numbers will differ, and demand reduction may be weaker or more erratic.

Debrief script

Ask first: who offered less than it was worth for their second or third permit? Why? Then reveal the table by unit: the ratios for units 2 and 3 versus unit 1. Show the price chart against the band. Lead the class to the key sentence: *my offer for an extra permit may set the price I pay for all the others*. Close with the numerical example in section 5.1 and ask who loses from demand reduction: the seller (the government, in a permit auction), through lower revenue, and sometimes efficiency, when a permit ends up with someone who values it less.

Theory and evidence

5.1 Benchmark: competitive band and demand reduction

Theoretical background

Competitive band. Sort the $3n$ values in an auction from high to low: $v_{(1)} \geq v_{(2)} \geq \dots$. With supply S , at any price p with $v_{(S+1)} \leq p \leq v_{(S)}$ the quantity that would be demanded by bidding exactly the value equals supply: that is the competitive (Walrasian) band. The efficient allocation gives the permits to the S highest values, and an auction's efficiency is the value of the permits allocated divided by that maximum.

Uniform price and the first permit. With the price equal to the highest rejected offer, the offer for the first permit matters in only two ways: it decides whether that permit is won and, if it is the highest rejected offer, it sets the price — but then the person wins no permit at all (her other offers are lower) and pays nothing. Bidding the value on the first permit is therefore weakly dominant; bidding more risks paying more than it is worth.

Demand reduction. The offer for the second or third permit, by contrast, can be the highest rejected offer while the first permit wins: it then sets the price the person pays for her other permits. Lowering it lowers that price at the cost of winning fewer permits. Example with $S = 3$: a person values her first two permits at 80 and 60, and the other offers in the auction are 90, 52 and 20.

Offer (80, 60) : wins 2 permits at price 52, $\pi = 140 - 104 = 36$;

Offer (80, 0) : wins 1 permit at price 20, $\pi = 80 - 20 = 60$.

Giving up the second permit raises her earnings; the permit goes to whoever offered 52, and if that person's value is below 60, efficiency is lost. With private values this incentive survives in equilibrium: uniform pricing does not lead to value bidding on extra units (Ausubel et al., 2014).

Discriminatory. If each winning offer pays itself, bidding the value leaves zero surplus on that permit: every unit is bid below value, and the shading depends on what the person expects from others rather than on the unit number. There is no dominant rule, and with multi-unit demand theory gives no general revenue ranking between this format and the uniform price.

Ascending clock. It is the open version of the uniform price: dropping a permit at a price below its value is demand reduction, and seeing total demand after each price makes it easier to do it in a coordinated way so that the clock stops early.

Simplifications in the game. Values are independent whole numbers between 10 and 100 and always decreasing; there is no resale, no banking of permits across rounds, no reserve price and no

free allocation (“grandfathering”). In the clock nobody can ask for a permit worth less than the current price: this rules out sure losses and guarantees that the clock stops (above 100 nobody asks for anything). If total demand at the final price is below S , the leftover permits go unsold: there is no rationing and no price rollback. Sealed bids above value are allowed.

5.2 Experimental evidence

Ausubel et al. (2014) show that in uniform-price auctions with multi-unit demand, bidders who can influence the price have an incentive to reduce demand, and that this can cost efficiency; it is the published version of an argument Ausubel and Cramton first circulated as a working paper.

Kagel and Levin (2001) observe it in the lab: in a uniform-price auction where one person wants two units, she reduces her offer for the second unit, and the open format, with information on others’ drop-outs, strengthens the reduction. List and Lucking-Reiley (2000) find the same pattern in a field experiment with sportscards: in the uniform-price auction, second-unit bids are lower than in a comparable Vickrey-type auction.

To design the RGGI CO₂ allowance auctions, Holt et al. (2007) compared the uniform-price sealed bid, the discriminatory auction and the ascending clock in the lab. Goeree et al. (2010) compare auctioning permits with giving them away for free (“grandfathering”) in the lab. Burtraw et al. (2009) let bidders communicate and find that communication facilitates collusion and lowers prices; it is the basis of the chat variant. Porter et al. (2009) describe the design, testing and implementation of an ascending clock in Virginia’s actual NO_x allowance auction.

The classroom version this game follows is that of Holt (2019) and his Veconlab programs (<https://veconlab.com>).

5.3 Regularities worth discussing

- Under uniform price, offers for the first permit tend to be close to value; those for the second and third, clearly below it, and the gap may grow with experience.
- Clearing prices tend to fall below the competitive band, especially with few bidders per auction and with communication.
- In the discriminatory auction every offer is below value; whether it raises more or less than the uniform price depends on how much bids are shaded in each format: theory gives no general ranking.
- Efficiency is usually high in every format: the most visible loss from demand reduction is revenue for whoever sells the permits.

Note

A class’s results are descriptive. With random values and auctions of 6 people, a single round’s price varies a lot by chance; compare averages over several rounds. The same person’s decisions over eight rounds are not independent observations, and the comparison of rounds 1–4 with 5–8 mixes learning with the luck of the values.

Basic modes

The three basic modes live in the same room (basic, in each language); the panel only allows one active session per room at a time.

6.1 Uniform price, one round

`permit_auction_en_uniform_1_round`: a single round of the basic format. Useful as a short demonstration or to collect “first-instinct” offers before explaining demand reduction. With a single round the report shows no charts by round and no comparison between halves.

6.2 Uniform price, 8 rounds

`permit_auction_en_uniform_8_rounds`: the reference configuration, described in Chapter 3. It shows whether offers for the second and third permits fall with experience.

6.3 Pay your bid (discriminatory), 8 rounds

`permit_auction_en_discriminatory_8_rounds`: same offers and same allocation, but each winning offer pays exactly what it offered. The instructions change only the pricing rule and the example (with offers 70, 60 and 20 and two permits, the person pays $70 + 60 = 130$ and earns 5).

Instructions

Round 1 of 8

In each round, **9 permits** are sold in an auction. Your auction has **6 people** (you and 5 others). They are the same people in every round.

Your values

Each permit lets you produce one unit. You can use up to 3 permits. At the start of each round you receive three values, one per permit: **the first permit has the highest value; the second is worth the same as or less than the first, and the third the same as or less than the second.**

Each value is a whole number between 10 and 100; every number is equally likely. They are drawn again every round and sorted from high to low. The other people's values are drawn the same way, and only each person knows their own.

Your earnings in the round = the sum of the values of the permits you get – what you pay for them. If you get one permit, it is the first; if you get two, the first and the second.

How permits are sold

Each person sends, without seeing the others, up to 3 offers: one for their first permit, one for the second and one for the third. Each offer is a whole number between 0 and 150 ECU. The offer for the second permit cannot be higher than the offer for the first, nor the third higher than the second. An offer of 0 means you do not bid for that permit.

All offers in the auction are ranked from highest to lowest. The 9 highest offers get one permit each. A tie for the last place is decided at random.

Price: each offer that gets a permit pays exactly what it offered.

Example: your values are 80, 55 and 30, and you offer 70, 60 and 20. If your first two offers get a permit, you pay $70 + 60 = 130$; you earn $80 + 55 - 130 = 5$ ECU.

- Your earnings in a round can be negative if you pay more for a permit than it is worth.
- Auctions are formed with 6 people; when the class does not divide evenly, the remaining people join the first auctions, which then sell more permits (3 for every 2 people, rounded down). With fewer than 6 participants, a single smaller auction is formed.
- There will be 8 rounds. Your earnings from all rounds are added up.
- Amounts are in ECU (experimental currency units). There is no cash payment.

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

Figure 6.1: Instructions for the discriminatory auction.

Your offers

Round 1 of 8

9 permits are sold in your auction (6 people).

Permit	Your value	Your offer (0 to 150)
1	99	84
2	90	74
3	68	54

Offer 1 $\geq$ offer 2 $\geq$ offer 3. Enter 0 if you do not bid for a permit.

Send offers

Powered by oTree

Figure 6.2: Offers in the discriminatory auction (simulated decisions).

The result shows what the person paid for each permit and the list of offers that won a permit in the auction, without saying whose they are.

Round result

Round 1 of 8

Your values 72 65 28	Your offers 54 47 19
Permits obtained 1	What you paid for each permit 54
Total paid 54 ECU	Your earnings 18 ECU
Cumulative earnings 18 ECU	Permits sold in your auction 9 / 9

Offers that got a permit in your auction: 84 · 82 · 77 · 74 · 68 · 63 · 62 · 58 · 54

Next round

Powered by oTree

Figure 6.3: Result in the discriminatory auction: she pays 54 for her one permit; below, the nine winning offers in the auction (simulated decisions).

In the report, the price measure is the average price paid per permit. Because it is computed over the winning offers, which are the highest in the auction, it can sit inside or above the competitive band even when every offer is below value (in the simulated session, 2 auction-rounds were below, 1 inside and 5 above). The shading shows up in the offer-as-a-percentage-of-value measure, not in

the average price.

Summary (all completed rounds)

Average price paid 57,1	Average competitive band 52,9 – 57,6	Price vs band (below / inside / above) 2 / 1 / 5
Average efficiency 99,7%	Average revenue per auction 514,5	Offer as % of value, by unit 73,1% · 70,3% · 66,9%

Price vs the competitive band, by round

Average across auctions. The lower and upper lines are the average ends of the competitive band.

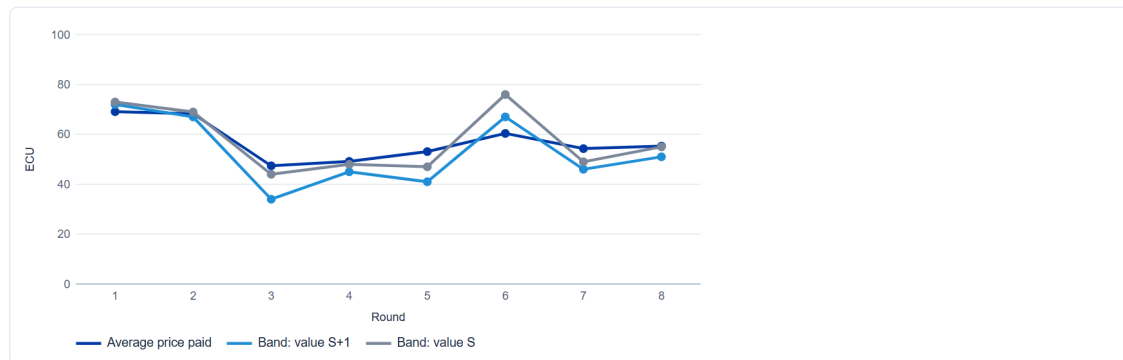


Figure 6.4: Report of a discriminatory session: summary and average price paid versus the band (6 participants, 8 rounds, simulated decisions).

For the instructor

In the simulated session (one auction of 6, 8 rounds; script in which each person offered between 60% and 85% of value on every permit), offers averaged 73.1%, 70.3% and 66.9% of value on units 1, 2 and 3: even shading, without the step of demand reduction. The average price paid was 57.1 against an average band of 52.9–57.6, and efficiency was 99.7%. That revenue per auction is higher here than in the uniform-price session comes from the scripts and is not evidence: with multi-unit demand, theory gives no general revenue ranking between the two formats.

Extended variants

Variant	What changes	What it is for
Ascending clock	The price rises by 5 from 10; each person says how many permits she wants at each price; the clock stops when total demand is $\leq S$.	See demand reduction in an open format, like that of some real permit auctions.
Uniform price with chat	60 seconds of chat among the auction's members before each round.	See whether communication coordinates low offers (collusion).

Both live in the extended room ([EN] **Permit Auction — extended**) and have 8 rounds.

7.1 Ascending clock

`permit_auction_extended_clock_8_rounds`. The price per permit starts at 10 and rises by 5. At each price, each person chooses how many permits she wants (0 to 3) with a button; she cannot ask for more than at the previous price or for a permit whose value is below the current price (those buttons are disabled). Each price lasts at most 20 seconds and ends earlier if everyone in the auction has answered; whoever does not answer in time keeps the previous quantity, reduced only by the value rule. As soon as total demand is less than or equal to S , the auction ends: each person gets what she asked for at that price and pays that price for each permit. Permits nobody asked for go unsold.

Instructions

Round 1 of 8

In each round, **9 permits** are sold in an auction. Your auction has **6 people** (you and 5 others). They are the same people in every round.

Your values

Each permit lets you produce one unit. You can use up to 3 permits. At the start of each round you receive three values, one per permit: **the first permit has the highest value; the second is worth the same as or less than the first, and the third the same as or less than the second.**

Each value is a whole number between 10 and 100; every number is equally likely. They are drawn again every round and sorted from high to low. The other people's values are drawn the same way, and only each person knows their own.

Your earnings in the round = the sum of the values of the permits you get – what you pay for them. If you get one permit, it is the first; if you get two, the first and the second.

How permits are sold

1. The price per permit starts at 10 ECU and rises in steps of 5.
2. At each price, each person states how many permits they want at that price (0 to 3). You cannot ask for more permits than at the previous price. You also cannot ask for a permit whose value is below the current price.
3. You have 20 seconds at each price. If you do not send your quantity in time, your quantity from the previous price is kept (at the start, 3), reduced only if some of those permits are worth less than the current price.
4. When everyone has sent their quantity (or time runs out), the total number of permits asked for is shown. If the total is 9 or less, the auction ends; otherwise the price rises.

At the end: each person gets the permits they asked for at the last price and pays that price for each one. Permits nobody asked for are not sold.

Example: your values are 80, 55 and 30. From the price 35 on you can no longer ask for the third permit (it is worth 30), so you ask for 2. If the auction ends at the price 40 with you asking for 2, you pay $2 \times 40 = 80$: you earn $80 + 55 - 80 = 55$ ECU.

- Auctions are formed with 6 people; when the class does not divide evenly, the remaining people join the first auctions, which then sell more permits (3 for every 2 people, rounded down). With fewer than 6 participants, a single smaller auction is formed.
- There will be 8 rounds. Your earnings from all rounds are added up.
- Amounts are in ECU (experimental currency units). There is no cash payment.

[Continue](#)

Powered by [gTTC](#)

Figure 7.1: Instructions for the ascending clock.

The screen shows the current price, the seconds left, the values, the current quantity, the buttons, and the table of previous prices with total demand at each. The server keeps time; the browser only displays the countdown.



Clock auction

Round 1 of 8

9 permits are sold in your auction (6 people).

Current price per permit
30

Seconds left
20

Your values
86 82 75

Your current quantity
3

How many permits do you want at this price?

0 permits

1 permit

2 permits

3 permits

Previous prices

Price	Total permits asked for
10	18
15	18
20	17
25	17

Powered by [oTree](#)

Figure 7.2: Clock mid-auction, before this person chooses: buttons beyond what is allowed are disabled (simulated decisions).



Clock auction

Round 1 of 8

9 permits are sold in your auction (6 people).

Current price per permit
30

Seconds left
19

Your values
86 82 75

Your current quantity
3

How many permits do you want at this price?

Quantity sent. Waiting for the other people (4/6).

Previous prices

Price	Total permits asked for
10	18
15	18
20	17
25	17

Powered by [oTree](#)

Figure 7.3: The same person after choosing: waiting for the others (4 of 6 have answered) (simulated decisions).

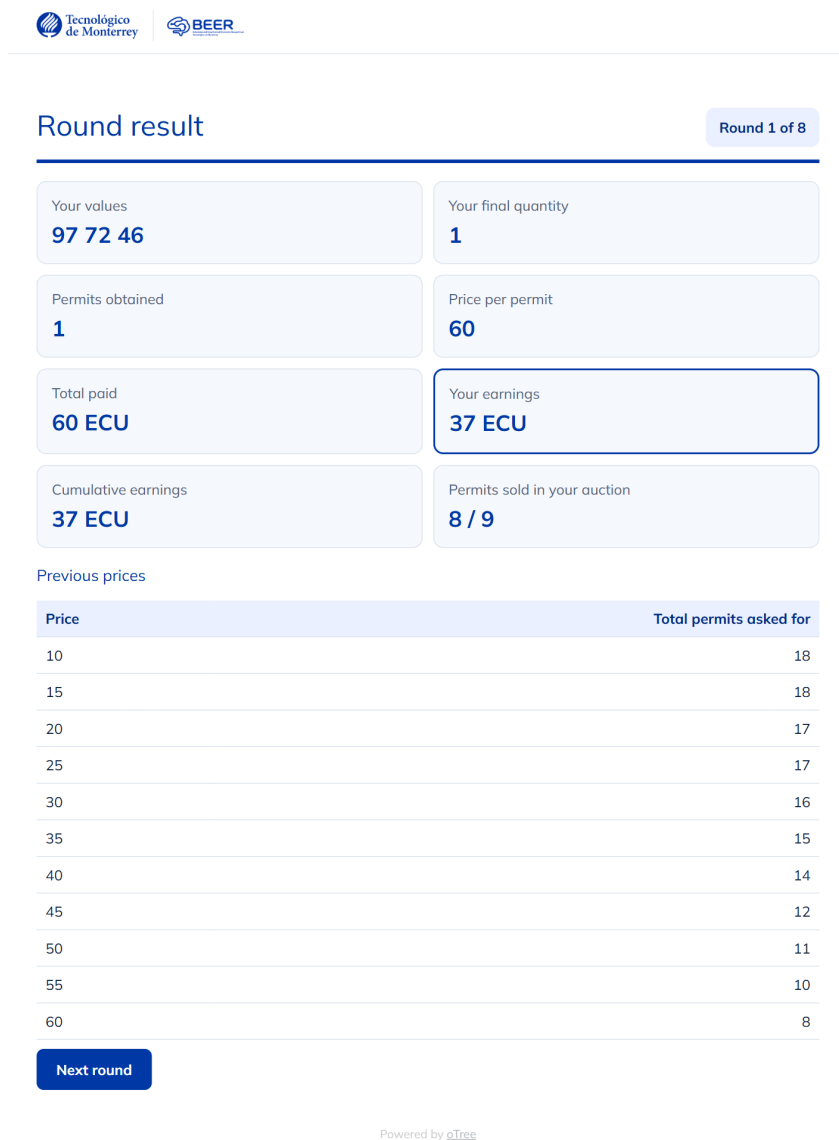


Figure 7.4: Clock result: final quantity, price, earnings and the clock's full path. In this round total demand went from 10 to 8 at the price 60, so one permit went unsold (simulated decisions).

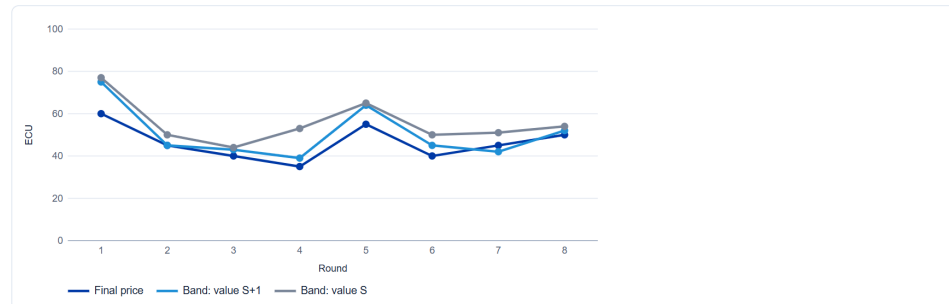
In the report, the clock's per-unit measure is the share of 1st, 2nd and 3rd permits a person stopped asking for while the price was still below their value. Automatic drops (from the value rule) do not count.

Summary (all completed rounds)

Final price 46,2	Average competitive band 50,6 – 55,5	Price vs band (below / inside / above) 6 / 2 / 0
Average efficiency 95,7%	Average revenue per auction 396,2	Units dropped while the price was below their value, by unit 0% · 37,5% · 62,5%

Price vs the competitive band, by round

Average across auctions. The lower and upper lines are the average ends of the competitive band.



Units dropped while the price was below their value, by unit

Share of 1st, 2nd and 3rd permits a person stopped asking for while the price was still below their value (demand reduction in the clock).

	Unit 1	Unit 2	Unit 3
Summary (all completed rounds)	0%	37,5%	62,5%
Rounds 1–4	0%	29,2%	58,3%
Rounds 5–8	0%	45,8%	66,7%

By unit and by round

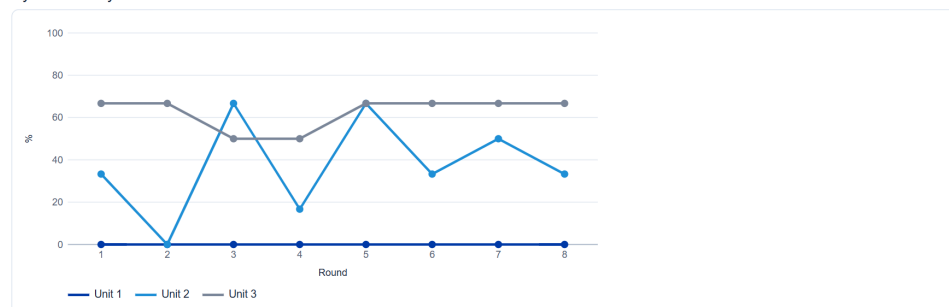


Figure 7.5: Clock report: summary, final price versus the band and units dropped below value (6 participants, 8 rounds, simulated decisions).

For the instructor

In the simulated session (one auction of 6, 8 rounds), the script had four people drop their second and third permits when the price reached between 50% and 85% of their value (one of them would also drop the first at 95%, which did not happen in this run), and two ask for everything their values covered. Result: average final price 46.2 against a band of 50.6–55.5 (6 rounds below the band, 2 inside), efficiency 95.7%, and 0%, 37.5% and 62.5% of units 1, 2 and 3 dropped while the price was below their value. The 5-ECU step can also leave the final price above a narrow band. These numbers are illustrative.

Note

Each clock round takes one to four minutes depending on how fast the auction answers, and eight rounds can take half an hour. If time is short, use the sealed-bid configuration. During the clock, do not use **Advance slowest participants** while auctions are still running

(section 9.2).

7.2 Uniform price with chat

`permit_auction_extended_uniform_chat_8_rounds`: the basic format, with 60 seconds of chat among the members of the same auction before each round. Nothing written there is binding. The cover rules say so (“except in the chat”), the instructions explain it, and the chat asks students not to write names or personal information. Each person can move on to the auction before the minute ends with **Go to the auction**.

The screenshot shows the BEER Lab interface. At the top, there are logos for 'Tecnológico de Monterrey' and 'BEER'. Below the logos, a yellow banner indicates 'Time left to complete this page: 0:57'. The main section is titled 'Messages' and shows 'Round 1 of 8'. A message box contains the following text: 'You can write to the people in your auction. You have 60 seconds. Do not write your name or any personal information.' Below this, a chat log shows three messages: 'Participant 4 (Me) What if nobody bids much for the second and third?', 'Participant 3 Fine. I will bid low on my third.', and 'Participant 5 Ok, let us see.' At the bottom of the chat log is a text input field and a 'Send' button. Below the chat log is a blue button labeled 'Go to the auction'. At the very bottom, it says 'Powered by oTree'.

Figure 7.6: Chat before a round (simulated messages).

Messages are downloaded under **Data** → **Chat**. If you project them, do so without identifying anyone.

Debrief script

Compare prices with and without chat (in separate sessions): did they fall? Were the agreements kept? What temptation did someone who had promised to bid low face? Connect with collusion monitoring in real permit auctions.

Class plan and reading the results

8.1 Suggested 50-minute session

0–5 min	Create the session (room <code>[EN] Permit Auction</code> , configuration <code>permit_auction_en_uniform_8_rounds</code>). Students join by QR code or link.
5–10 min	Cover, instructions and comprehension check. Explain in one sentence what an emissions permit is if your course needs it (the screens only speak of “permits”).
10–25 min	8 rounds of offers (under two minutes per round). Follow progress in the Monitor.
25–30 min	Open the hidden report; ask for predictions: did people offer the same for all three permits? Did the price land below or above what they expected?
30–42 min	Reveal results. Show the table by unit, the price chart against the band and the histogram. Discuss.
42–50 min	Wrap-up: the demand-reduction example in section 5.1; compare with the discriminatory auction and the clock; connect with the design of the RGGI auctions.

If you have two class sessions, use the second for the discriminatory auction or the clock and compare the two reports.

8.2 Discussion questions

- Did you offer the same for your first permit as for your third, relative to its value? Why?
- When does your offer for the second permit set the price you pay for the first?
- If everyone reduces demand, who wins and who loses? Does efficiency change, or only the split?
- Why should nobody offer their value in the discriminatory auction? Does the government raise less?
- In the clock, what did total demand tell you? Did you use it to drop permits earlier?
- If the designer of a permit auction fears collusion, which format and what public information would she prefer?

8.3 Common misinterpretations

Misreading	Clarification
“Under uniform price nobody pays their own offer, so bidding value is always optimal.”	It is for the first permit. Not for the extra ones: that offer can set the price of your other permits.
“Offering less for the third permit is irrational: you give up something valuable.”	It can be the right response: you lose a low-margin permit in exchange for a lower price on all the others.
“The discriminatory auction raises more because everyone pays their offer.”	Offers fall on every unit; revenue can be higher, equal or lower than under the uniform price. Theory gives no general ranking.
“A price below the band proves there were agreements.”	It also appears without communication, as the result of individual demand reduction.
“High efficiency means nothing happened.”	Demand reduction mostly hits revenue; with few misallocated permits, efficiency barely moves.

Operations, privacy and troubleshooting

9.1 Privacy and conduct

Participant codes are anonymous: do not ask for or show names, student IDs or seats next to individual decisions. Project only aggregate results (averages, charts, histograms). The session's data stay available to you under **Data**; do not share them outside teaching use or research authorized by the lab.

9.2 If someone disconnects: Advance slowest participants

Each round of an auction waits for all of its members to decide. If a student disconnects, ask them to reopen the room in the same browser: it resumes where it left off. If they cannot, use **Advance slowest participants** in the Monitor; the button advances whoever is on the furthest-behind screen in the whole session (up to 20 people at a time). This is what the game records:

- **Sealed bid, on the offer screen:** the server does not see anything typed but not sent, so three offers of **0** (no bid) are recorded. The person gets no permits and earns 0. In the report those offers count as 0% of value on all three units: they lower the per-unit ratios and can look like demand reduction. And with fewer offers competing, the price in that auction falls.
- **Clock, with one person absent:** the clock does not stop for her. Each price waits the full 20 seconds and then applies the time-out rule to the absent person: she keeps her previous quantity and only drops permits whose value falls below the price. In other words, the absent person “asks for” everything her values cover. When the clock ends, the others wait on the results screen; at that point you can advance the absent person, who is the only one still on the clock screen.
- **Clock, if you click the button while auctions are running:** everyone on the clock screen in the furthest-behind round is advanced at once, and their clock ends instantly by applying the time-out rule to *all* of them from the current price: each keeps the permits her values cover, as if nobody had reduced demand. If several auctions are in the same round, all of their clocks end. Avoid this. The same happens if the clock page reaches its time limit (460 seconds, almost 8 minutes).
- On the cover page, the comprehension check and the chat, advancing someone just moves them to the next screen (the chat ends by itself after 60 seconds).

9.3 Common problems

Situation	What to do
Someone sees “La sesión está llena” (session full).	You declared fewer participants than arrived. Close the room and create another session with the correct number.
An auction keeps waiting.	Someone has not sent their offers. Ask them to reopen the room in the same browser, or use Advance slowest participants (section 9.2).
Someone cannot send their offers.	An offer is higher than the one for the previous permit or is not a whole number from 0 to 150. They must type all three again.
In the clock, a button does not respond.	It asks for more permits than at the previous price, or for a permit worth less than the price: it is disabled on purpose.
The clock sold fewer than S permits.	Total demand fell below S at the last price; the rest goes unsold.
Negative earnings.	Only if someone offers above value (sealed bid). They are part of the game; ECU are not converted into money.
A different game appears in Demo or Rooms.	The panel does not belong to this game. Do not start the session; notify the lab.
You need to repeat the activity with the same group.	Create a new session in the same room; the previous session’s data stay under Sessions .

9.4 Data for later analysis

Data → **Custom export (permit_auction)** gives one row per participant and round: session, anonymous code, round, language, edition, format, auction, auction size, permits offered, the three values, the three offers (sealed bid), the clock path as **price:quantity** pairs (with * at prices where the person did not answer in time), final quantity and number of time-outs (clock), permits obtained, payment, earnings, clearing price, competitive band, the auction’s revenue and efficiency, and comprehension attempts. It contains no personal identifiers. Chat messages are under **Data** → **Chat**.

Annotated bibliography

- [Holt \(2019\)](#): the classroom version and its Veconlab programs (“Emissions Permits” and “Multi-Unit Auctions”).
- [Holt et al. \(2007\)](#): the RGGI auction design report, with the experiments comparing formats.
- [Goeree et al. \(2010\)](#): auctioning versus grandfathering permits, in the lab.
- [Burtraw et al. \(2009\)](#): collusion in permit auctions when communication is allowed; basis of the chat variant.
- [Ausubel et al. \(2014\)](#): the theory of demand reduction and its efficiency cost.
- [Kagel and Levin \(2001\)](#): demand reduction in the lab; the open format strengthens it.
- [List and Lucking-Reiley \(2000\)](#): demand reduction in a field experiment.
- [Porter et al. \(2009\)](#): an ascending clock in a real permit auction (NO_x , Virginia).

Bibliography

- Ausubel, L. M., Cramton, P., Pycia, M., Rostek, M., & Weretka, M. (2014). Demand reduction and inefficiency in multi-unit auctions. *Review of Economic Studies*, 81(4), 1366–1400. [doi:10.1093/restud/rdu023](https://doi.org/10.1093/restud/rdu023). Published version of Ausubel and Cramton’s working paper (1996/2002, University of Maryland); the working paper is **not verified** on Crossref.
- Burtraw, D., Goeree, J., Holt, C. A., Myers, E., Palmer, K., & Shobe, W. (2009). Collusion in auctions for emission permits: An experimental analysis. *Journal of Policy Analysis and Management*, 28(4), 672–691. [doi:10.1002/pam.20460](https://doi.org/10.1002/pam.20460).
- Goeree, J. K., Holt, C. A., Palmer, K., Shobe, W., & Burtraw, D. (2010). An experimental study of auctions versus grandfathering to assign pollution permits. *Journal of the European Economic Association*, 8(2–3), 514–525. [doi:10.1111/j.1542-4774.2010.tb00522.x](https://doi.org/10.1111/j.1542-4774.2010.tb00522.x) (Crossref also lists [doi:10.1162/jeea.2010.8.2-3.514](https://doi.org/10.1162/jeea.2010.8.2-3.514) for the same article).
- Holt, C. A. (2019). *Markets, Games, and Strategic Behavior: An Introduction to Experimental Economics* (2nd ed.). Princeton University Press. No DOI. “Emissions Permits” and “Multi-Unit Auctions” programs on Veconlab: <https://veconlab.com>.
- Holt, C. A., Shobe, W., Burtraw, D., Palmer, K., & Goeree, J. K. (2007). *Auction Design for Selling CO₂ Emission Allowances Under the Regional Greenhouse Gas Initiative*. Final report to RGGI (NYSERDA). SSRN copy (2014): [doi:10.2139/ssrn.2459462](https://doi.org/10.2139/ssrn.2459462).
- Kagel, J. H., & Levin, D. (2001). Behavior in multi-unit demand auctions: Experiments with uniform price and dynamic Vickrey auctions. *Econometrica*, 69(2), 413–454. [doi:10.1111/1468-0262.00197](https://doi.org/10.1111/1468-0262.00197).
- List, J. A., & Lucking-Reiley, D. (2000). Demand reduction in multiunit auctions: Evidence from a sportscard field experiment. *American Economic Review*, 90(4), 961–972. [doi:10.1257/aer.90.4.961](https://doi.org/10.1257/aer.90.4.961).
- Porter, D., Rassenti, S., Shobe, W., Smith, V., & Winn, A. (2009). The design, testing and implementation of Virginia’s NOx allowance auction. *Journal of Economic Behavior & Organization*, 69(2), 190–200. [doi:10.1016/j.jebo.2007.09.007](https://doi.org/10.1016/j.jebo.2007.09.007).

Room QR codes

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

Permit auction

English room



permitauction.beer-lab.org/room/permit_auction_en

Scan the code and click **Start**.

Permit auction

English room, extended version



`permitauction.beer-lab.org/room/permit_auction_extended`

Scan the code and click **Start**.

Permit auction

Sala en español



permitauction.beer-lab.org/room/permit_auction_es

Escanee el código y pulse **Comenzar**.

Permit auction

Sala en español, versión extendida



`permitauction.beer-lab.org/room/permit_auction_extendido`

Escanee el código y pulse **Comenzar**.