



Instructor guide to the double-marginalization game

Laboratory implementation, theoretical foundations,
experimental evidence, and variants

Behavioral and Experimental Economics Research Lab
Department of Economics



Revised edition | October 2026

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

How to use this guide

This guide supports preparation, implementation, and discussion of the double-marginalization family at the Behavioral and Experimental Economics Research Lab (BEER Lab), Department of Economics, Tecnológico de Monterrey. It is written for instructors in principles, intermediate microeconomics, industrial organization, strategy, contracts, regulation, and experimental economics.

No previous experience with oTree, vertical channels, or classroom experiments is required. The document combines an operational path and a conceptual path. Early chapters launch a session and explain participant and instructor screens.

Theory chapters derive separated and integrated prices and explain why a fixed fee can allocate rent without distorting a marginal decision. Extensions appear after common material so instructors can activate only the comparison relevant to their course. Appendices provide a configuration catalog, assessment bank, and glossary.

Author

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For the instructor

For a first use, select the basic one-interaction version. Ask for predictions of the wholesale and final prices before revealing outcomes. During feedback, separate three questions: how much the channel earns, how that profit is divided, and what happens to consumers. Keep the aggregate report hidden until every channel finishes and never project individual participant codes.

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Quick guide and learning outcomes

1.1 Access through the updated laboratory website

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

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



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



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

Checking resources, comprehension, and participant requirements

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

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

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

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

nalización — una interacción	Doble marginalización / Double
nalización — 10 rondas, pareja fija	
nalización — 10 rondas, parejas reasignadas	
nalización — una interacción	Doble marginalización / Double Marginalization — BEER Lab Seleccione una variante de este juego. Select a version of this game.
nalización — 10 rondas, pareja fija	
nalización — 10 rondas, parejas reasignadas	
ginalization — one interaction	
ginalization — 10 rounds, fixed partner	
ginalization — 10 rounds, reassigned partners	
nalización extendido — referencia, una interacción	
nalización extendido — referencia, pareja fija	
nalización extendido — referencia, parejas reasignadas	
Fnalización extendido — posiciones alternadas	
nalización extendido — integración vertical	
nalización extendido — tope al precio mayorista	
nalización extendido — tarifa en dos partes	
nalización extendido — poder de negociación del minorista	
nalización extendido — demanda incierta	
nalización extendido — costo de distribución	
ouble Marginalization — baseline, one interaction	
ouble Marginalization — baseline, fixed partner	
ouble Marginalization — baseline, reassigned partners	
ouble Marginalization — alternating positions	
ouble Marginalization — vertical integration	
ouble Marginalization — wholesale-price cap	
ouble Marginalization — two-part tariff	
ouble Marginalization — retailer bargaining power	
ouble Marginalization — demand uncertainty	
ouble Marginalization — distribution cost	

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

Rooms

Current rooms:

[ES] Doble marginalización
[EN] Double Marginalization
[ES] Doble marginalización: extendido
[EN] Double Marginalization: extended

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

Room: [EN] Double Marginalization

Create a new session

Session Config

[EN] Double Marginalization — one interaction

Number of participants

Complete groups of 2 participants. Use a multiple of 2; minimum 2.

Create

[Configure session](#) 

App sequence

double_marginalization_game (10 rounds)

Bilingual double-marginalization and vertical-contracting teaching game.

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

Downloading a session with several rounds

For the instructor

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

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

Attention

The public route <https://doublemarginalization.beer-lab.org/> is proposed for laboratory deployment. The instance verified in this delivery is <http://localhost:8040> with `GAME_FAMILY=doublemarginalization`. Demo must show 26 configurations and Rooms exactly four rooms. Do not begin class if any other family appears.

Purpose	Understand how successive markups raise final price and reduce sales and joint profit.
Experimental unit	A vertical channel formed by a manufacturer and a retailer.
Basic edition	One interaction, ten fixed-partner rounds, and ten reassigned-partner rounds in Spanish and English.
Extended edition	Alternating positions, integration, wholesale cap, two-part tariff, retailer offer, demand uncertainty, and distribution cost.
Decision	Wholesale price, contract terms, acceptance, and final price as required by the treatment.
Outcome	Quantity, role profits, channel profit, consumer surplus, and channel efficiency.
Students	https://doublemarginalization.beer-lab.org/room/double_marginalization_en
Instructor	https://doublemarginalization.beer-lab.org/demo
Local test	http://localhost:8040/demo .
Topics	vertical relations; double marginalization; contracts; vertical integration; industrial organization.
JEL	C92; D43; L22; L42.

Students should be able to distinguish wholesale from final price; derive the retailer's best response; solve the manufacturer decision by backward induction; explain the vertical externality; compare separation and integration; calculate quantity, profit, and surplus; explain how a two-part tariff may coordinate a channel; analyze bargaining power and uncertainty; and read distributions without mistaking a mean for uniform conduct. Instructors should connect each report panel to a theoretical question and state the limits of a classroom sample.

The interface credits 3,000 ECU plus operating profit in each round. This constant protects displayed balances when a fixed fee produces low operating profit; it does not alter the maximizing choice. Manufacturer and retailer profits remain separate because an intervention may increase joint efficiency while hurting one party. Coordination and division are distinct objects.

Checkpoint

Before opening a room, solve five values without the guide: under separation, $w = 70$, $p = 95$, $Q = 25$, and profits 1,250/625; under integration, $p = 70$ and $Q = 50$. Without these objects, the report can become a discussion of colors and averages without mechanism.

Economic model and predictions

An upstream manufacturer and downstream retailer form the channel. Final demand is $Q = \max\{0, A - p\}$, where p is final price and $A = 120$ in the benchmark. The manufacturer produces at marginal cost $c_U = 20$ and charges w for each unit sold. Baseline downstream cost is zero. Profits are

$$\pi_U = (w - 20)(120 - p), \quad \pi_D = (p - w)(120 - p).$$

Timing is sequential: the manufacturer sets w , then the retailer observes it and selects p . The wholesale price is a private cost to the retailer and revenue to the manufacturer, so it vanishes when profits are added. Channel profit is $(p - 20)(120 - p)$, but each firm maximizes its own component.

2.1 Retail response and manufacturer choice

Given w , the retailer maximizes $(p - w)(120 - p)$. Its first-order condition is $120 - p - (p - w) = 0$, so

$$p(w) = \frac{120 + w}{2}, \quad Q(w) = \frac{120 - w}{2}.$$

The retailer is not adding a fixed percentage markup. It balances the margin on all units against the demand lost from one more unit of price. A one-unit increase in w raises p by one half and lowers quantity by one half; pass-through is incomplete in this linear benchmark.

The manufacturer anticipates that response and maximizes

$$\pi_U(w) = (w - 20) \frac{120 - w}{2}.$$

Its first-order condition yields $w^* = 70$. The retailer sets $p^* = 95$ and sells $Q^* = 25$. Manufacturer profit is 1,250 and retailer profit is 625, for channel profit of 1,875. This outcome is subgame perfect because the retailer response is optimal after every feasible wholesale price, not only after 70.

Theoretical foundation

Double marginalization is a vertical externality. When raising final price, the retailer considers its own margin but not the manufacturer's lost margin on units no longer sold. The manufacturer uses w to extract rent even though it raises perceived downstream cost. Individually optimal choices yield less joint profit than a coordinated decision.

Feedback script

Draw a price ladder: cost 20, wholesale price 70, final price 95. Then draw the integrated path from cost 20 to price 70. Ask which segment is a transfer, which is a markup, and which decision reduces quantity. Close with consumer, manufacturer, and retailer columns so that “efficiency” never becomes shorthand for everybody gaining.

2.2 Integration, consumers, and welfare

An integrated firm ignores the internal transfer w and maximizes $(p - 20)(120 - p)$. It chooses $p^I = 70$, sells 50, and earns 2,500. Separation raises price from 70 to 95, cuts sales from 50 to 25, and preserves only 75% of integrated monopoly profit. Consumer surplus is $Q^2/2$: 1,250 under integration and 312.5 under separation. Profit plus consumer surplus is 3,750 and 2,187.5, respectively.

Integration is not perfect competition. The integrated firm retains monopoly power and charges 70 above cost 20. The total-surplus benchmark would have $p = 20$ and $Q = 100$. Keep three references distinct: vertical separation, integrated monopoly, and competitive allocation. Removing double marginalization raises output but does not eliminate the remaining monopoly markup.

The report defines channel efficiency as observed joint profit divided by maximum integrated-monopoly profit for the round’s parameters. This answers whether the channel captures available private surplus. It is not complete social welfare and says nothing by itself about fairness in the split.

2.3 Contracts and bargaining power

A two-part tariff has per-unit price w and fixed fee F . With $w = 20$, the retailer faces true channel marginal cost and selects $p = 70$. The fee reallocates rent without changing the marginal condition: profits become F and $2,500 - F$, if the retailer accepts. Participation requires the contract to beat the retailer’s outside option. Rejections in the teaching design show that a coordinating contract’s existence does not guarantee agreement.

When the retailer proposes w , proposal power changes. A price near 20 can coordinate the final choice but leaves no per-unit rent upstream. Acceptance limits retailer extraction. The treatment isolates how proposal rights affect terms, agreement, and division; it does not claim that one side has full power in every real market.

A cap $w \leq 50$ creates a boundary solution: $w = 50$, $p = 85$, and $Q = 35$. Profits are 1,050 and 1,225, with channel profit 2,275. The rule helps consumers and raises joint profit relative to separation, yet lowers manufacturer profit from 1,250. Correcting an externality need not benefit every party.

2.4 Uncertainty and distribution cost

Under uncertainty, A equals 100 or 140 with equal probability. The manufacturer chooses before the state and the retailer observes it before choosing p . A risk-neutral manufacturer’s ex-ante optimum remains 70 because $E[A] = 120$. The retailer adapts with $(A + w)/2$. Evaluate the manufacturer ex ante and the retailer conditional on its state; a poor realized outcome does not establish a poor information-contingent decision.

With downstream distribution cost $c_D = 10$, the retailer maximizes $(p - w - 10)(120 - p)$. The manufacturer chooses $w = 65$; the continuous final price is 97.5 and quantity 22.5, with profits 1,012.5 and 506.25. Integer controls make 97 and 98 relevant neighbors. An integrated firm faces total cost 30 and selects $p = 75$, $Q = 45$. This distinguishes successive real costs from successive markups.

Access, rooms, and technical preparation

The institutional route starts at <https://beer-lab.org/>. Its teaching section opens <https://teaching.beer-lab.org/>, where the double-marginalization card should lead to <https://doublemarginalization.beer-lab.org/>. Instructors use <https://doublemarginalization.beer-lab.org/demo>; students receive only the selected room or individual session links. Every route in this delivery was verified at <http://localhost:8040>.

The instance contains six basic and twenty extended configurations across languages. Rooms lists `doble_marginalizacion_es`, `double_marginalization_en`, `doble_marginalizacion_extendido`, and `double_marginalization_extended`. Scoping occurs before oTree starts; Demo, Rooms, Sessions, and Data therefore belong to this family when `GAME_FAMILY=doublemarginalization` and a separate database are used.

Participant count must be even. Reassignment needs at least four people to create an alternative match. Open the session before class, test a link privately, confirm language, treatment, rounds, and matching, and keep the report open. Never reuse an old participant code after a database recreation.

For the instructor

Prepare demand, costs, and timing on one sheet; decide whether ECU are illustrative or convertible; check zoom and projection; and reserve two test computers. Students should not access Demo. Reveal the report only after closure. If someone waits, inspect the partner's computer before restarting or creating another session.

The minimum check is to open Demo and count 26 configurations, open Rooms and count four rooms, enter the basic English room and verify only three basic configurations, launch four participants, and reach the revealed report. Another family indicates failed scoping. An extended first option in a basic room indicates a prefix or suffix-exclusion problem.

Participant experience

The cover presents the logo, BEER Lab affiliation, academic purpose, and six common rules. Students accept silence, private choice, no refresh, and private assistance. This standardizes procedure across courses. Instructions describe the channel, demand, costs, timing, 3,000 ECU balance, worked example, rounds, and matching. Comprehension asks who observes w , quantity at $w = 70$, $p = 95$, manufacturer profit, and round count.



Welcome

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

Figure 4.1: Welcome and individual reading. Institutional cover. Continuation 1/2.

In this activity, you will be part of a vertical chain with a manufacturer and a retailer. The two pricing decisions determine demand, profits, and channel efficiency.

Blue identifies the manufacturer and orange the retailer. The manufacturer sees the feasible w range and, when applicable, fixed fee. The retailer sees a contract box with w , F , demand state, and distribution cost. Under integration, a green card identifies the joint manager. The design makes ownership and information visible rather than requiring students to remember an abstract role label.

Outcomes show w , p , quantity, channel profit, efficiency, and consumer surplus. Separate cards show each role profit and own credited ECU. The benchmark is a conditional reference, not a correct-answer flag. The final round reaches an explicit completion page with cumulative ECU and position counts.

☐ I have read and agree to follow these rules.

Welcome

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

In this activity, you will be part of a vertical chain with a manufacturer and a retailer. The two pricing decisions determine demand, profits, and channel efficiency.

General laboratory rules

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

☐ I have read and agree to follow these rules.

Start

Powered by [oTree](#)

Figure 4.2: Welcome and individual reading. Institutional cover. Continuation 2/2.



Instructions

Resources and unit of account

Each participant's starting account per round: 3000 ECU. The round's profit or loss is added to that account.

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

This session does not convert ECU into real money.

Vertical separation with wholesale pricing



The vertical chain

The manufacturer produces the good at a cost of 20 per unit and sells basic units to the retailer. The retailer sells the same good to final consumers.

Demand and profits

If the final price is p , quantity sold is $Q = \max(0, 120 - p)$. Initial resources and experimental units. Q unless the treatment adds a cost or fixed fee.

Figure 4.3: Current basic edition instructions, with initial resources and experimental units. Continuation 1/2

Order of decisions

The manufacturer sets w ; the retailer then observes w and sets p .

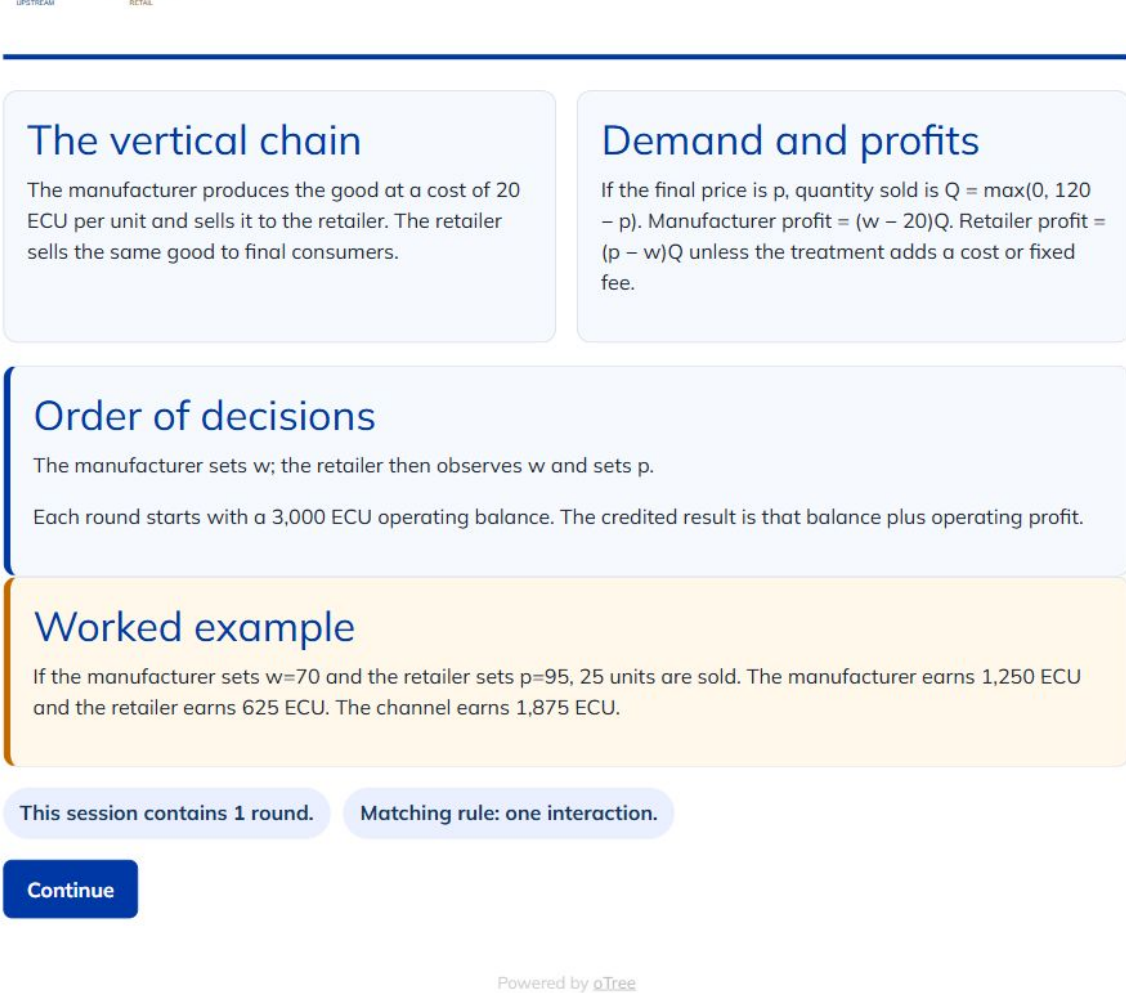


Figure 4.4: Current basic-edition instructions, with initial resources and experimental units.
Continuation 2/2.

What participants will see

Participants should always know their position, available decision, observed information, and payoff formula. During play, clarify fields or repeat written formulas, but do not recommend a price, announce other channels' behavior, or reveal interim aggregates. Strategic advice changes the treatment.



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

Comprehension check

Resources and unit of account

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

This session does not convert ECU into real money.

Vertical separation with wholesale pricing

In the baseline design, who observes the wholesale price before setting the final price?

- ☐ Retailer
- ☒ Manufacturer
- ☐ Both firms decide simultaneously

Your answer: Manufacturer. The correct answer is Retailer. Review the order of decisions, demand and profit formula, and number of rounds.

If $w=70$ and $p=95$, how many units are sold?

25

If $w=70$, the manufacturer's cost is 20, and 25 units are sold, what is manufacturer profit?

1250 ECU

How many rounds are in this session?

- ☒ 1
- ☐ 10

Figure 4.5: Current comprehension check with an incorrect answer, its specific explanation, and retained responses. Continuation 1/2.

Comprehension check

Resources and unit of account

ECU stands for Experimental Currency Units. It is the unit of account for this activity.
This session does not convert ECU into real money.

Vertical separation with wholesale pricing

In the baseline design, who observes the wholesale price before setting the final price?

- ☐ Retailer
☒ Manufacturer
☐ Both firms decide simultaneously

Your answer: Manufacturer. The correct answer is Retailer. Review the order of decisions, demand, profit formula, and number of rounds.

If $w=70$ and $p=95$, how many units are sold?

25

If $w=70$, the manufacturer's cost is 20, and 25 units are sold, what is manufacturer profit?

1250 ECU

How many rounds are in this session?

- ☒ 1
☐ 10

Check answers

Powered by [oTree](#)

Figure 4.6: Current comprehension check with an incorrect answer, its specific explanation, and retained responses. Continuation 2/2.

Channel decision

Round 1 / 1

Vertical separation with wholesale pricing



YOUR POSITION

Manufacturer

You move first and set the wholesale price the retailer pays for every unit sold.

Wholesale price w

Enter an integer from 20 to 120 ECU.

Confirm contract

Powered by [oTree](#)

Figure 4.7: Role-specific decisions. Manufacturer decision.

Channel decision

Round 1 / 1

Vertical separation with wholesale pricing



YOUR POSITION

Retailer

You observe the contract terms and set the price paid by final consumers.

Observed contract

Wholesale price: 70 ECU

Final price p

Enter an integer from 70 to 150 ECU.

Confirm final price

Powered by [oTree](#)

Figure 4.8: Retailer with observed contract.



Round result

Round 1 / 1

Vertical separation with wholesale pricing

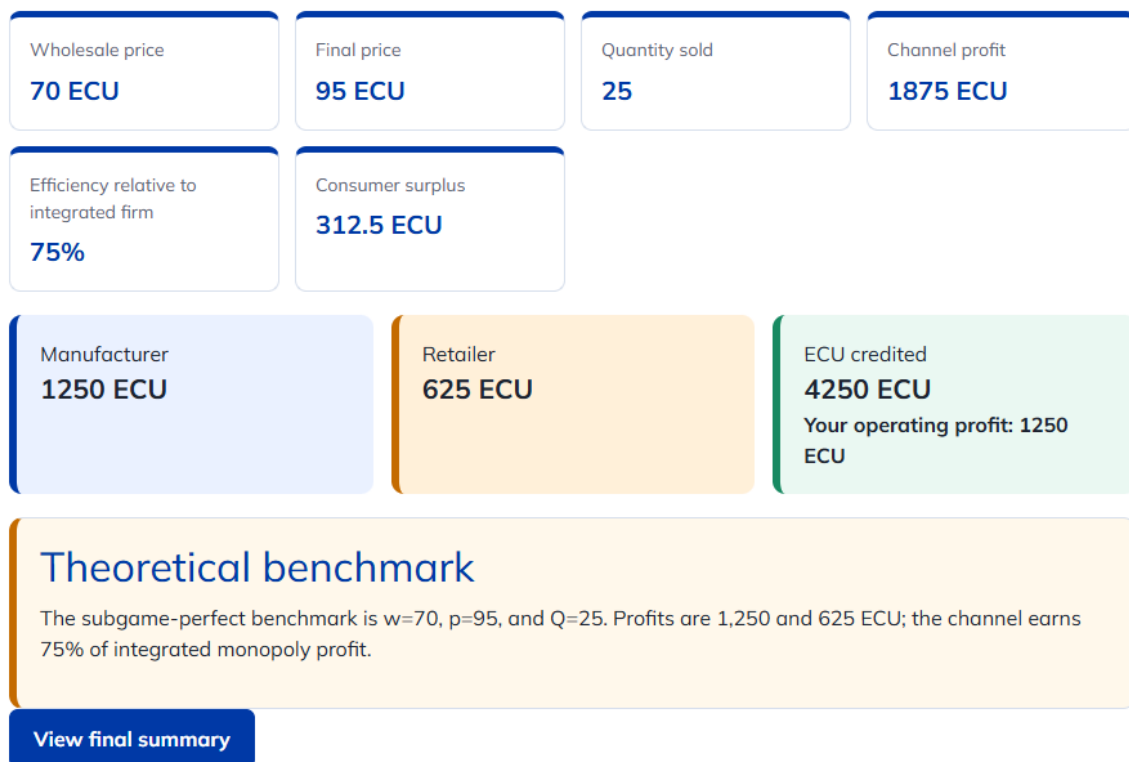
Powered by [oTree](#)

Figure 4.9: Result and ending without a generic terminal page. Channel outcome.



Activity completed

You have completed all decisions. Please wait quietly for the instructor's directions.

ECU accumulated in the activity

4250 ECU

Rounds as manufacturer

1

Rounds as retailer

0

Finish

Powered by [oTree](#)

Figure 4.10: Explicit completion.

Extensions and teaching comparisons

Teach the baseline before extensions. Fixed matching allows relationship-specific learning and accommodation; reassignment weakens persistent bilateral reputation without making rounds fully independent. Alternating positions compares the same person under manufacturer and retailer incentives.

5.1 Integration and wholesale cap

Integration gives one manager the final-price choice and splits joint profit equally. Compare price 70 with 95, quantity 50 with 25, and joint profit 2,500 with 1,875. Equal division motivates both participants but is not a model of merger bargaining. The cap retains two firms and sequential timing while restricting w to 50. It separates ownership from a contractual or regulatory restraint and provides a clear incidence discussion.

5.2 Two-part tariff and retailer power

The manufacturer selects w and F ; the retailer accepts or rejects and, upon acceptance, selects p . A coordinating tariff has $w = 20$ and $p = 70$, while F allocates profit. Study whether high fees cause rejection and whether low per-unit prices reduce final price. Under retailer offer, the proposal right changes sides. A low offer can coordinate but compress upstream rent; acceptance makes bargaining power observable.

5.3 Demand uncertainty and distribution cost

The manufacturer knows the demand states but not the realization when choosing w ; the retailer observes it before p . Compare wholesale choices ex ante and retail adaptation within state. Do not label a choice erroneous with hindsight. Distribution cost adds 10 ECU of real resource cost downstream. Its separate display prevents double counting and supports the question of whether a high final price reflects costs, market power, or both.

Channel decision

Round 1 / 10

Vertical integration



UPSTREAM

RETAIL

YOUR POSITION

Integrated-firm manager

The channel acts as one firm. Set the final price; total profit is split equally between the two members.

Demand intercept: 120

Final price p

Enter an integer from 20 to 150 ECU.

Confirm channel price

Powered by [oTree](#)

Figure 5.1: Final-price choice under vertical integration.

Channel decision

Round 1 / 10

Wholesale-price cap



YOUR POSITION
Manufacturer

You move first and set the wholesale price the retailer pays for every unit sold.

Wholesale price w

Enter an integer from 20 to 50 ECU.

Confirm contract

Powered by [oTree](#)

Figure 5.2: Wholesale cap and pass-through. Manufacturer under the cap.

Channel decision

Round 1 / 10

Wholesale-price cap



UPSTREAM

RETAIL

YOUR POSITION

Retailer

You observe the contract terms and set the price paid by final consumers.

Observed contract

Wholesale price: 50 ECU

Final price p

Enter an integer from 50 to 150 ECU.

Confirm final price

Powered by [oTree](#)

Figure 5.3: Retail response.

Channel decision

Round 1 / 10

Two-part tariff



YOUR POSITION

Manufacturer

You move first and set the wholesale price the retailer pays for every unit sold.

Wholesale price w Enter an integer from 20 to 120 ECU.

Fixed fee F Enter an integer from 0 to 2500 ECU. The fee is transferred from retailer to manufacturer if the contract is accepted.

Confirm contract

Powered by [oTree](#)

Figure 5.4: Two-part tariff. Manufacturer contract.

Channel decision

Round 1 / 10

Two-part tariff



YOUR POSITION

Retailer

You observe the contract terms and set the price paid by final consumers.

Observed contract

Wholesale price: 20 ECU

Fixed fee: 1200 ECU

Do you accept the contract?

☐ Accept the contract and set a final price

☐ Reject the contract

Final price p

Enter an integer from 20 to 150 ECU.

Confirm final price

Powered by [oTree](#)

Figure 5.5: Retailer acceptance and price.

Channel decision

Round 1 / 10

Retailer bargaining power



YOUR POSITION

Retailer

You represent the retailer and propose a per-unit wholesale price to the manufacturer. The manufacturer may accept or reject.

Wholesale price w

Enter an integer from 20 to 120 ECU.

Send proposal

Powered by [oTree](#)

Figure 5.6: Proposal power and agreement. Retailer offer.

Channel decision

Round 1 / 10

Retailer bargaining power



YOUR POSITION
Manufacturer

The retailer proposes $w=20$ ECU per unit. Do you accept?

Do you accept the contract?

☐ Accept the proposal

☐ Reject the proposal

Confirm response

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Figure 5.7: Manufacturer response.

Channel decision

Round 1 / 10

Demand uncertainty



YOUR POSITION

Manufacturer

You move first and set the wholesale price the retailer pays for every unit sold.

Demand may be low (100) or high (140). The manufacturer does not know the state when choosing.

Wholesale price w

Enter an integer from 20 to 120 ECU.

Confirm contract

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Figure 5.8: Demand information sequence. Manufacturer before the state.

Channel decision

Round 1 / 10

Demand uncertainty



UPSTREAM

RETAIL

YOUR POSITION

Retailer

You observe the contract terms and set the price paid by final consumers.

Observed contract

Wholesale price: 70 ECU

Demand intercept: 140

Final price p

Enter an integer from 70 to 150 ECU.

Confirm final price

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Figure 5.9: Retailer observes demand.

Channel decision

Round 1 / 10

Distribution cost



YOUR POSITION

Manufacturer

You move first and set the wholesale price the retailer pays for every unit sold.

Wholesale price w

Enter an integer from 20 to 120 ECU.

Confirm contract

Powered by [oTree](#)

Figure 5.10: Real costs and contractual prices. Manufacturer in the cost treatment.

Channel decision

Round 1 / 10

Distribution cost



UPSTREAM

RETAIL

YOUR POSITION

Retailer

You observe the contract terms and set the price paid by final consumers.

Observed contract

Wholesale price: 65 ECU

c_D : 10 ECU

Final price p

Enter an integer from 75 to 150 ECU.

Confirm final price

Powered by [oTree](#)

Figure 5.11: Retailer sees distribution cost.

Instructor report and interpretation

The report is private, anonymous, and aggregate. Before completion it shows participants, complete decisions, pending decisions, and interactions, with a disabled reveal button. After closure the instructor can reveal or hide. This prevents projected contracts from influencing unfinished channels.

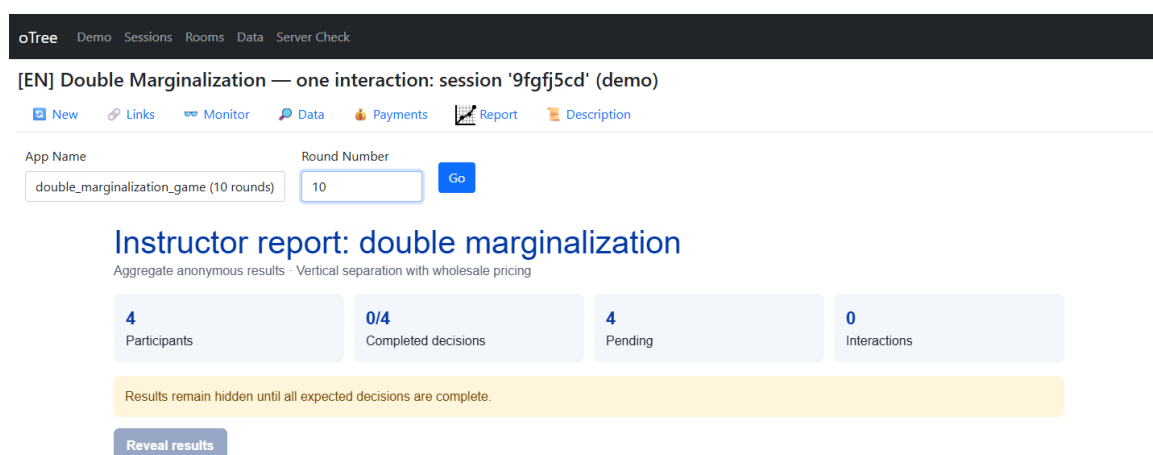


Figure 6.1: Controlled release of aggregate results. Protected report.

The first row summarizes w , p , quantity, role profits, joint profit, efficiency, and consumer surplus. Histograms keep wholesale blue and final price orange. Read shape and denominator: a mean of 70 may hide masses at 40 and 100. Round evolution reports prices, quantity, efficiency, and completed channels. Contract treatments add acceptance; uncertainty adds demand-state counts.

Diagnosis should follow the causal sequence. Start with w , then inspect $p - w - c_D$, then quantity and joint profit, and only then division. If w is near 70 but p disperses, retailer response is central. If w is low and p high, correcting the first markup was insufficient. If prices coordinate but contracts are rejected, feasible coordination and implemented agreement diverge.

Feedback script

Reveal in five steps: w distribution, p distribution, quantity, separate profits, then efficiency and consumers. Ask for a prediction before each step. Use description, benchmark comparison, and cautious interpretation. Do not infer fairness, risk aversion, or collusion without a comparison capable of separating mechanisms.

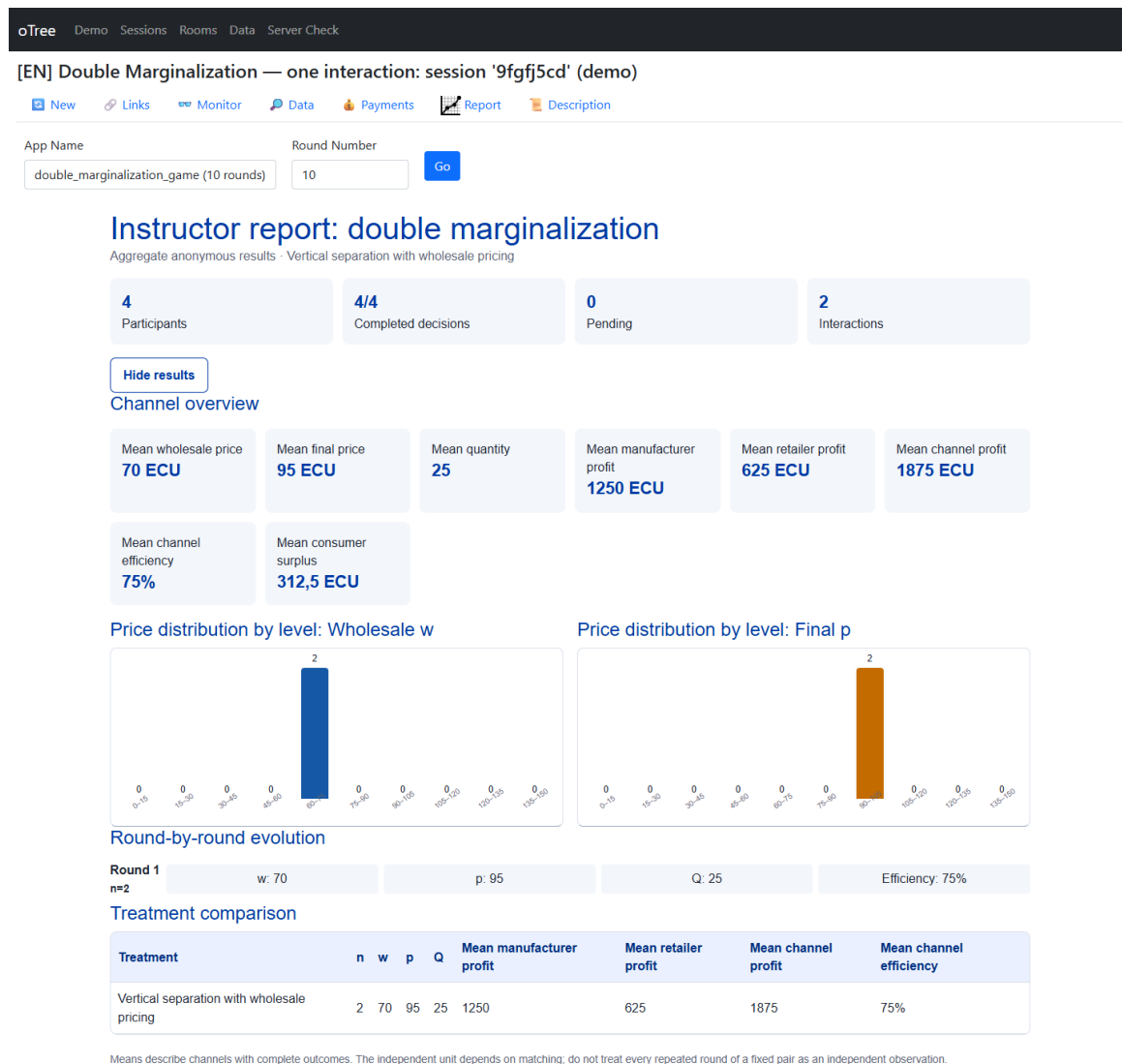


Figure 6.2: Revealed report.

Lesson plans and teaching sequences

For a 50-minute introduction, use five minutes for a real channel, ten for reading and comprehension, five for play, ten for the retailer response, ten for solving w , and ten for report and integration. The exit question should explain why two firms with market power earn less jointly than one integrated firm and why consumers also lose.

For 80 minutes, use ten fixed-partner rounds. Ask for private predictions of p after w . Compare the first and last three rounds, aggregating by pair for learning claims. Discuss whether lower w reflects coordination, reciprocity, or calculation. A later reassignment session weakens stable-relationship explanations.

For 90 minutes, assign channels to separation versus integration or linear versus two-part tariffs. Hold language, parameters, rounds, and incentives constant. Collect hypotheses first, reveal reports separately, and build a common table with w , p , Q , profits, acceptance, and consumers. One class can teach mechanisms and signs but may not provide statistical power.

An advanced class can compare uncertainty and distribution costs. Under uncertainty, assess information sets; under costs, separate transfer from real resources. Ask groups to propose a policy or contract and trace incidence. Running every extension in one session sacrifices depth; choose one question and one principal contrast.

Checkpoint

A complete plan specifies objective, treatment, prediction, independent unit, time, primary metric, reveal order, and closing question. Without a prior prediction, the benchmark can explain anything after the fact. Without an independent unit, ten rounds create false precision.

Solved exercises and discussion

At $w = 60$, the retailer selects $p = 90$ and sells 30. Profits are 1,200 and 900, for 2,100 jointly. Lowering w from 70 raises joint and retailer profit but lowers manufacturer profit. If the retailer instead charges 80, it sells 40 and earns 800 while the manufacturer earns 1,600. The deviation moves toward coordination yet is privately costly downstream.

With tariff $(w, F) = (20, 1,800)$, the retailer chooses 70 and the channel earns 2,500. Profits are 1,800 and 700. At $F = 2,600$, acceptance yields -100 downstream, so rejection is optimal with outside option zero. Marginal coordination and participation are separate constraints.

With low demand $A = 100$ and $w = 70$, the retailer selects 85 and sells 15; with high demand it selects 105 and sells 35. Manufacturer profit is 750 or 1,750, averaging 1,250. Retail profit is 225 or 1,225, averaging 725. The ex-ante choice can be optimal without being state-by-state optimal.

With distribution cost 10 and $w = 65$, price 98 sells 22. Manufacturer profit is 990 and retailer profit 506. Price 97 sells 23 and gives 1,035 and 506. Integer neighbors can be nearly tied; the continuous benchmark 97.5 should not become a single mandatory answer.

Theoretical foundation

Classify cost, transfer, decision, and consequence. Production and distribution costs use real resources; w is an internal transfer and incentive; w , F , acceptance, and p are decisions at different stages; Q , profit, and surplus are consequences. This prevents double counting and organizes every extension.

Experimental evidence and scope

Spengler (1950) presents the classic possibility that integrating successive monopolies lowers price by eliminating accumulated margins. This is an efficiency mechanism, not a blanket endorsement of integration: richer markets may include foreclosure, discrimination, investment, and quality effects. The activity isolates double marginalization before adding those complications.

Durham (2000) examines vertical relationships experimentally and finds the externality when downstream is monopolized, while downstream competition changes behavior. The teaching implication is to ask how many retailers exist before applying the bilateral formula. The current game uses one retailer to make the two markups transparent.

Research on contract formats shows that mechanisms theoretically capable of coordination can perform differently with human decision makers. Ho and Zhang study nonlinear pricing formats; Lantz (2009) studies negotiation and optional two-part tariffs and reports efficiency improvements relative to direct negotiation. This motivates measuring format, acceptance, and trajectories rather than final price alone.

The classroom adaptation uses linear demand, integer controls, an ECU balance, and equal splitting under integration. It preserves the target mechanisms but is not an exact replication of any paper's population, parameters, or payments. Classroom data confront predictions and generate questions; they do not automatically represent firms or a wider population.

Attention

Causal claims require treatment assignment, common protocol, and analysis that recognizes dependence. Incentives, course composition, prior discussion, and attrition can change outcomes. Report the scope of every comparison and do not label deviations irrational merely because they differ from a point prediction.

Data, ethics, troubleshooting, and closure

The export records anonymous code, round, language, edition, treatment, matching, position, demand state, w , F , acceptance, p , quantity, profits, consumer surplus, and efficiency. A code links rounds but should not be combined with names or student IDs in projected or shared data. A disconnect is missing, not zero. Fixed-pair observations are correlated and should be aggregated or modeled accordingly.

If a page says “Please wait,” inspect the partner’s computer and stage. If the user no longer exists, return to current session links. Missing styles require a cache refresh and static-asset check. A hidden report usually means pending decisions. Restart the local instance after code or settings changes because prodserver does not reload. Never use `resetdb` on production as a screen fix.

During play, manage procedure rather than strategy. Repeat written formulas or solve connectivity; do not suggest 70 or 95, comment on other channels, or praise a choice before closure. Log interruptions. After feedback, export with family, date, course, treatment, and session, and retain the Git commit, ECU conversion, and verbal deviations.

For the instructor

Technical and pedagogical closure follow one sequence: complete, verify pending cases, reveal, describe, compare, interpret, and archive. Require an explanation containing both decisions, the externality, and one report fact. Listing 70 and 95 without mechanism or describing a chart without theory is incomplete.

Configuration selection and diagnostics

11.0.1 1. One-interaction benchmark

`double_marginalization_en_one_round` is selected when the learning objective is to introduce double marginalization without learning or reputation. The instructor should state the comparison before launch, keep every other institutional element fixed, and record class size and matching. Compare w , p , and Q with 70, 95, and 25. A useful debrief asks students to distinguish the decision variable from the market consequence, then to explain whether any departure changes channel profit, its division, consumer surplus, or all three. The configuration is evidence about behavior under its stated rules; it should not be pooled mechanically with another treatment merely because both use the same app.

11.0.2 2. Repeated benchmark with fixed partner

`double_marginalization_en_10_rounds_fixed_partner` is selected when the learning objective is to study learning, accommodation, and dependence within a relationship. The instructor should state the comparison before launch, keep every other institutional element fixed, and record class size and matching. Compare early and late rounds without treating each row as independent. A useful debrief asks students to distinguish the decision variable from the market consequence, then to explain whether any departure changes channel profit, its division, consumer surplus, or all three. The configuration is evidence about behavior under its stated rules; it should not be pooled mechanically with another treatment merely because both use the same app.

11.0.3 3. Benchmark with reassignment

`double_marginalization_en_10_rounds_random_partners` is selected when the learning objective is to reduce persistent bilateral relationships and separate reputation from experience. The instructor should state the comparison before launch, keep every other institutional element fixed, and record class size and matching. Require at least four participants and document the encounter network. A useful debrief asks students to distinguish the decision variable from the market consequence, then to explain whether any departure changes channel profit, its division, consumer surplus, or all three. The configuration is evidence about behavior under its stated rules; it should not be pooled mechanically with another treatment merely because both use the same app.

11.0.4 4. Extended baseline, one interaction

`double_marginalization_extended_baseline_one_round` is selected when the learning objective is to provide a control for contractual extensions. The instructor should state the comparison

before launch, keep every other institutional element fixed, and record class size and matching. Keep parameters identical to the basic version. A useful debrief asks students to distinguish the decision variable from the market consequence, then to explain whether any departure changes channel profit, its division, consumer surplus, or all three. The configuration is evidence about behavior under its stated rules; it should not be pooled mechanically with another treatment merely because both use the same app.

11.0.5 5. Extended baseline, fixed partner

`double_marginalization_extended_baseline_fixed_partner` is selected when the learning objective is to build a longitudinal comparison within the extended menu. The instructor should state the comparison before launch, keep every other institutional element fixed, and record class size and matching. Examine convergence and possible implicit accommodation. A useful debrief asks students to distinguish the decision variable from the market consequence, then to explain whether any departure changes channel profit, its division, consumer surplus, or all three. The configuration is evidence about behavior under its stated rules; it should not be pooled mechanically with another treatment merely because both use the same app.

11.0.6 6. Extended baseline, reassignment

`double_marginalization_extended_baseline_random_partners` is selected when the learning objective is to provide a control with less persistent relationships. The instructor should state the comparison before launch, keep every other institutional element fixed, and record class size and matching. Compare distributions rather than means alone. A useful debrief asks students to distinguish the decision variable from the market consequence, then to explain whether any departure changes channel profit, its division, consumer surplus, or all three. The configuration is evidence about behavior under its stated rules; it should not be pooled mechanically with another treatment merely because both use the same app.

11.0.7 7. Alternating positions

`double_marginalization_extended_alternating_positions` is selected when the learning objective is to separate position effects from persistent personal differences. The instructor should state the comparison before launch, keep every other institutional element fixed, and record class size and matching. Each person should appear as manufacturer and retailer; compare conduct by position. A useful debrief asks students to distinguish the decision variable from the market consequence, then to explain whether any departure changes channel profit, its division, consumer surplus, or all three. The configuration is evidence about behavior under its stated rules; it should not be pooled mechanically with another treatment merely because both use the same app.

11.0.8 8. Vertical integration

`double_marginalization_extended_vertical_integration` is selected when the learning objective is to show how a joint decision removes the vertical externality. The instructor should state the comparison before launch, keep every other institutional element fixed, and record class size and matching. The benchmark is $p = 70$, $Q = 50$, and joint profit of 2,500 ECU. A useful debrief asks students to distinguish the decision variable from the market consequence, then to explain whether any departure changes channel profit, its division, consumer surplus, or all three. The configuration is evidence about behavior under its stated rules; it should not be pooled mechanically with another treatment merely because both use the same app.

11.0.9 9. Wholesale-price cap

`double_marginalization_extended_wholesale_cap` is selected when the learning objective is to study a restriction on the first markup without merging firms. The instructor should state the comparison before launch, keep every other institutional element fixed, and record class size and matching. With $w \leq 50$, compare $p = 85$ and $Q = 35$ with separation. A useful debrief asks students to distinguish the decision variable from the market consequence, then to explain whether any departure changes channel profit, its division, consumer surplus, or all three. The configuration is evidence about behavior under its stated rules; it should not be pooled mechanically with another treatment merely because both use the same app.

11.0.10 10. Two-part tariff

`double_marginalization_extended_two_part_tariff` is selected when the learning objective is to distinguish marginal coordination from rent allocation. The instructor should state the comparison before launch, keep every other institutional element fixed, and record class size and matching. Look for w near 20, p near 70, and variation in the fixed fee. A useful debrief asks students to distinguish the decision variable from the market consequence, then to explain whether any departure changes channel profit, its division, consumer surplus, or all three. The configuration is evidence about behavior under its stated rules; it should not be pooled mechanically with another treatment merely because both use the same app.

11.0.11 11. Retailer offer

`double_marginalization_extended_retailer_offer` is selected when the learning objective is to shift proposal power and observe acceptance and surplus division. The instructor should state the comparison before launch, keep every other institutional element fixed, and record class size and matching. Do not interpret a low offer without the 20 ECU cost and acceptance decision. A useful debrief asks students to distinguish the decision variable from the market consequence, then to explain whether any departure changes channel profit, its division, consumer surplus, or all three. The configuration is evidence about behavior under its stated rules; it should not be pooled mechanically with another treatment merely because both use the same app.

11.0.12 12. Demand uncertainty

`double_marginalization_extended_demand_uncertainty` is selected when the learning objective is to separate the manufacturer's ex-ante choice from the retailer's ex-post adaptation. The instructor should state the comparison before launch, keep every other institutional element fixed, and record class size and matching. Assess w before the state and p conditional on $A = 100$ or $A = 140$. A useful debrief asks students to distinguish the decision variable from the market consequence, then to explain whether any departure changes channel profit, its division, consumer surplus, or all three. The configuration is evidence about behavior under its stated rules; it should not be pooled mechanically with another treatment merely because both use the same app.

11.0.13 13. Distribution cost

`double_marginalization_extended_distribution_cost` is selected when the learning objective is to show how another marginal cost moves prices and reduces sales. The instructor should state the comparison before launch, keep every other institutional element fixed, and record class size and matching. The separated benchmark is $w = 65$, $p \simeq 97.5$, and $Q \simeq 22.5$. A useful debrief asks

students to distinguish the decision variable from the market consequence, then to explain whether any departure changes channel profit, its division, consumer surplus, or all three. The configuration is evidence about behavior under its stated rules; it should not be pooled mechanically with another treatment merely because both use the same app.

Assessment bank with expected answers

12.0.1 Question 1: Why is $w = 70$ under separation?

Expected reasoning. The manufacturer anticipates the retailer's best response and maximizes $(w - 20)(120 - w)/2$; its first-order condition gives 70. Ask the student to name the choice, the information set, and the market consequence before giving a numerical answer. **Frequent error.** Calling 70 the monopoly final price confuses wholesale and retail prices. A strong answer also states which comparison in the instructor report would support or challenge the explanation and why the evidence remains descriptive unless treatment assignment identifies a causal contrast.

12.0.2 Question 2: Why does the retailer choose $p = 95$?

Expected reasoning. Given $w = 70$, it maximizes $(p - 70)(120 - p)$ and balances margin against quantity; the first-order condition gives 95. Ask the student to name the choice, the information set, and the market consequence before giving a numerical answer. **Frequent error.** Adding an arbitrary markup ignores the demand reduction. A strong answer also states which comparison in the instructor report would support or challenge the explanation and why the evidence remains descriptive unless treatment assignment identifies a causal contrast.

12.0.3 Question 3: Where is the vertical externality?

Expected reasoning. When raising p , the retailer ignores the manufacturer's lost margin on units no longer sold. Ask the student to name the choice, the information set, and the market consequence before giving a numerical answer. **Frequent error.** Calling it an environmental or technological externality hides that it operates inside the channel. A strong answer also states which comparison in the instructor report would support or challenge the explanation and why the evidence remains descriptive unless treatment assignment identifies a causal contrast.

12.0.4 Question 4: Is integration the same as perfect competition?

Expected reasoning. No. The integrated firm retains monopoly power and selects $p = 70$, above the cost of 20. Ask the student to name the choice, the information set, and the market consequence before giving a numerical answer. **Frequent error.** Setting $p = 20$ also removes the monopoly markup and answers a different question. A strong answer also states which comparison in the instructor report would support or challenge the explanation and why the evidence remains descriptive unless treatment assignment identifies a causal contrast.

12.0.5 Question 5: Why does a fixed fee not change quantity?

Expected reasoning. A fixed fee does not change the marginal return from one additional sale; the per-unit price does. Ask the student to name the choice, the information set, and the market consequence before giving a numerical answer. **Frequent error.** Subtracting it as marginal cost changes the first-order condition incorrectly. A strong answer also states which comparison in the instructor report would support or challenge the explanation and why the evidence remains descriptive unless treatment assignment identifies a causal contrast.

12.0.6 Question 6: What is channel efficiency?

Expected reasoning. It is observed joint profit as a percentage of maximum integrated-monopoly profit for those costs and demand. Ask the student to name the choice, the information set, and the market consequence before giving a numerical answer. **Frequent error.** It is neither total social welfare nor a percentage of correct answers. A strong answer also states which comparison in the instructor report would support or challenge the explanation and why the evidence remains descriptive unless treatment assignment identifies a causal contrast.

12.0.7 Question 7: What does the wholesale cap show?

Expected reasoning. Restricting the first markup can lower final price and raise quantity and joint profit while redistributing profit. Ask the student to name the choice, the information set, and the market consequence before giving a numerical answer. **Frequent error.** Assuming every cap benefits both firms equally. A strong answer also states which comparison in the instructor report would support or challenge the explanation and why the evidence remains descriptive unless treatment assignment identifies a causal contrast.

12.0.8 Question 8: How should uncertainty be assessed?

Expected reasoning. Use the information available when w was chosen, then study how p adapts to the observed state. Ask the student to name the choice, the information set, and the market consequence before giving a numerical answer. **Frequent error.** Judging the ex-ante decision with the revealed state confuses choice and luck. A strong answer also states which comparison in the instructor report would support or challenge the explanation and why the evidence remains descriptive unless treatment assignment identifies a causal contrast.

12.0.9 Question 9: What does position rotation add?

Expected reasoning. It compares the same person under manufacturer and retailer incentives and reduces confounding between position and type. Ask the student to name the choice, the information set, and the market consequence before giving a numerical answer. **Frequent error.** Treating rotated rounds as independent observations. A strong answer also states which comparison in the instructor report would support or challenge the explanation and why the evidence remains descriptive unless treatment assignment identifies a causal contrast.

12.0.10 Question 10: Why inspect histograms?

Expected reasoning. Two classes may have the same mean and opposite distributions; shape reveals concentration, heterogeneity, and extremes. Ask the student to name the choice, the

information set, and the market consequence before giving a numerical answer. **Frequent error.** Reading the tallest bar without its bins and denominator. A strong answer also states which comparison in the instructor report would support or challenge the explanation and why the evidence remains descriptive unless treatment assignment identifies a causal contrast.

12.0.11 Question 11: Is a retailer offer of 20 unfair?

Expected reasoning. It exactly covers manufacturer cost; its distributional meaning depends on the outside option, acceptance, and rules. Ask the student to name the choice, the information set, and the market consequence before giving a numerical answer. **Frequent error.** Inferring moral intent from the number alone. A strong answer also states which comparison in the instructor report would support or challenge the explanation and why the evidence remains descriptive unless treatment assignment identifies a causal contrast.

12.0.12 Question 12: What changes with distribution cost?

Expected reasoning. Total marginal cost rises to 30, the retailer's best response raises price, and the channel sells less. Ask the student to name the choice, the information set, and the market consequence before giving a numerical answer. **Frequent error.** Adding the cost to wholesale price and subtracting it twice. A strong answer also states which comparison in the instructor report would support or challenge the explanation and why the evidence remains descriptive unless treatment assignment identifies a causal contrast.

12.0.13 Question 13: What is independent with fixed matching?

Expected reasoning. The relationship or pair is a natural level for many summaries; its ten rounds are correlated. Ask the student to name the choice, the information set, and the market consequence before giving a numerical answer. **Frequent error.** Multiplying sample size by ten because ten rounds are observed. A strong answer also states which comparison in the instructor report would support or challenge the explanation and why the evidence remains descriptive unless treatment assignment identifies a causal contrast.

12.0.14 Question 14: What does convergence establish?

Expected reasoning. It shows the aggregate pattern approaching the prediction; it does not identify individual preferences or reasoning by itself. Ask the student to name the choice, the information set, and the market consequence before giving a numerical answer. **Frequent error.** Equating numerical proximity with proven rationality. A strong answer also states which comparison in the instructor report would support or challenge the explanation and why the evidence remains descriptive unless treatment assignment identifies a causal contrast.

12.0.15 Question 15: When should the report be revealed?

Expected reasoning. After choices close: prices first, then quantity and profit, and finally efficiency and distributions. Ask the student to name the choice, the information set, and the market consequence before giving a numerical answer. **Frequent error.** Projecting partial results while someone is still choosing. A strong answer also states which comparison in the instructor report would support or challenge the explanation and why the evidence remains descriptive unless treatment assignment identifies a causal contrast.

Routes and glossary

Student routes are https://doublemarginalization.beer-lab.org/room/doble_marginalizacion_es, https://doublemarginalization.beer-lab.org/room/double_marginalization_en, https://doublemarginalization.beer-lab.org/room/doble_marginalizacion_extendido, and https://doublemarginalization.beer-lab.org/room/double_marginalization_extended. Instructors use <https://doublemarginalization.beer-lab.org/demo>. Replace the host with <http://localhost:8040> for the verified local instance. Public routes require laboratory DNS, proxy, process, and independent database configuration.

Double marginalization: accumulated markups at successive levels that raise price and reduce quantity and joint profit. **Manufacturer:** upstream firm. **Retailer:** downstream seller to consumers. **Wholesale price:** internal per-unit payment. **Final price:** consumer payment. **Vertical externality:** effect of one channel member's decision on another member's profit that is not internalized.

Vertical integration: joint control of successive levels. **Two-part tariff:** per-unit price plus fixed payment. **Participation constraint:** requirement that a contract beat an outside option. **Coordination:** inducing the joint-profit-maximizing decision. **Bargaining power:** institutional ability to propose, accept, or capture rent. **Pass-through:** final-price response to a cost or wholesale-price change.

Channel efficiency: joint profit as a percentage of the integrated maximum. **Consumer surplus:** area under demand and above price. **Fixed matching:** repeated relationship with the same person. **Reassignment:** new partner between rounds. **Independent unit:** level contributing separate information. **Controlled reveal:** instructor action that displays results after closure. **ECU:** experimental unit of account.

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