INFORMS TutORials in Operations Research

Publication details, including instructions for authors and subscription information:
http://pubsonline.informs.org

Using Simple Games to Teach Supply Chain Management

https://orcid.org/0000-0002-7037-7896Elena Katok

informs
http://pubsonline.informs.org/series/educ

TUTORIALS IN OPERATIONS RESEARCH
 | ISBN 978-0-9906153-7-8
https://doi.org/10.1287/educ.2022.0242

Using Simple Games to Teach Supply Chain Management

Elena Katok[a]
[a] Naveen Jindal School of Management, University of Texas at Dallas, Richardson, Texas 75080
Contact: ekatok@utdallas.edu, https://orcid.org/0000-0002-7037-7896 (EK)

Abstract Classroom simulations (sometimes referred to as games) are often used in operations and supply chain management courses to improve student involvement. Many popular games are often quite complicated and require a significant amount of class time. But there is also value in using simple games to quickly illustrate one key point and to motivate material. In this article, I discuss games that I use in the classroom, drawn almost directly from my research, for three topics: inventory and contracting, competitive bidding, and trust and collaboration. For each topic, I explain the specific goals the games are designed to accomplish. I also discuss the game setup and how to modify games designed for research to be used in the classroom. Where appropriate, I also share my typical experience with student reactions and feedback.

Keywords behavioral operations management • classroom simulations • experiential learning • newsvendor problem • contracts • auctions

1. Introduction

In business school courses, linking material to real-world experiences is both essential and often challenging. Some of the methods we use to accomplish this connection include using current-event examples, videos, news articles, and case studies. In this article, I will describe another method—simple games. I became interested in using simple games in the classroom because my research involves behavioral experiments with human subjects conducted in a controlled laboratory setting. Often this research yields insights that are useful for the classroom. However, usually, experiments used for research cannot be readily used for teaching. To solve this problem, I started working on systematically converting some of the experiments used in my research into classroom simulations. By doing this, I discovered that this conversion is quite systematic, and I will share these ideas and my experiences in this article.

I will discuss three of the topics that I found to benefit from classroom simulations: inventory and contracting; competitive bidding; auction design; and trust and collaboration.

1.1. Converting Games from Research to Class

Most of the games I describe here originated in research papers (sometimes but not always mine). The process of running a game in the classroom is different from running it in the laboratory, and making research experiments classroom-friendly involves several basic principles.

In the laboratory we often have students play many rounds because we want to make sure that results are not due to initial confusion. In the classroom, it is important to keep students engaged, so the number of rounds should be much smaller. For example, 100 newsvendor game rounds in the laboratory may turn into 20 in the class, or 20 auctions in the laboratory turn into 4 in the classroom. A related point is that in the laboratory we often employ random matching. In the classroom, I recommend simply keeping the same groups for all rounds of the game, and not mentioning this at the beginning to prevent unwanted communication. The reason is that with random matching, the game runs as fast as the slowest person each round. With partner matching, each group goes at its own pace, so it is less likely that the game will be excessively long.

At least as important is the fact that partner matching makes it possible to look at the performance of individual groups during a debriefing session, which may lead to interesting discussions. The rule of thumb I use is that the classroom game should not take more than 15 minutes.

In the laboratory, we typically use carefully written instructions to establish control. In the classroom, formal control is not important, but making sure that students grasp the general idea of the game quickly is. Therefore, I find it effective to explain the game, perhaps using slides, and allow students to ask questions. This not only is faster than making them read instructions but also invites more interaction.

In the laboratory, we usually conduct multiple treatments. There is no time to do this in the classroom, so it is important to select one treatment that would be the most useful for making the desired point.

And finally, although we generally do not debrief experiments in the laboratory, a debriefing session is a crucial feature of classroom games, so it is essential to have automated summary reports that can be exhibited immediately upon completion.

1.2. What You Need to Implement

Classroom games, unlike laboratory games, should run over the internet. Many laboratory games are still implemented in zTree (Fischbacher [5]), which is not useful in the classroom (although there is a version that does work over the internet called zTree unleashed (Duch et al. [3]) with which I don't have personal experience).

I find that a good option is a web-based platform for game creation, such as SoPHIE (see Hendriks [7]) or oTree (see Chen et al. [1]). Neither platform requires the help of a professional programmer (although some programming experience is useful). I also find that it is important to be able to program reports capable of showing results in real time.

Another useful feature is to have a single portal for students so that they can log into a class and see the game(s) that will be used during a particular lecture. This feature, called SoPHIE Classroom, is available for use with any web-based game (not only the ones implemented using SoPHIE). From the instructor's end, there should be a way to upload the class list, activate the game, see who participated, and show reports. SoPHIE Classroom has these features. The screenshots I show in this article are from games that I implemented using SoPHIE.

2. Inventory and Contracting

2.1. The Newsvendor Game

The newsvendor problem is a fundamental building block of stochastic inventory theory, and it also has applications to a wide range of topics often covered in operations management

Box 1: The Newsvendor Problem

In the *newsvendor problem*, the decision maker must decide how many units of inventory to order before knowing the realization of stochastic demand. Each unit ordered costs a fixed amount. The number of units sold is the minimum of the order and the demand. Each unit sold is sold at a profit. So if the number of units ordered is smaller than the demand, there are lost sales—and sometimes lost goodwill. If the number of units ordered is larger than the demand, there are unsold units that can be disposed of at some salvage value. Therefore, the decision maker faces a trade-off between the cost of ordering too many and the cost of ordering too few units. The objective of the game is to determine the order quantity that maximizes the player's profit.

classes. First tested in the laboratory by Schweitzer and Cachon [11], who documented the "pull-to-center" effect, the newsvendor game also became one of the most widely studied topics in behavioral operations. Easy to implement and conduct in the classroom, the newsvendor game is useful to demonstrate that when solving the problem intuitively, people tend to deviate from the optimal solution in systematic ways, leaving money on the table. This is a good way to motivate studying the analytical solution.

Newsvendor experiments, including the Schweitzer and Cachon [11] study, often include low-profit and high-profit conditions. Methodologically, comparing behavior in problems with the high and the low critical ratio is important to rule out risk aversion as the sole explanation, to give one example. In the classroom, however, the goal is to present students with a somewhat realistic scenario, and for this reason, I use the high critical ratio version of the problem. The game consists of only two main screens (before the final screen shown at the end of the game), such as the Decision screen in Figure 1(a) and the Results screen in Figure 1(b).

I would like to comment on a few features I included on these screens. First, displaying *problem parameters* at the top of all screens eliminates the need for providing instructions or any other reference materials. It is a good idea to design the screens so that each screen is self-contained. The Decision screen in Figure 1(a) includes a Calculator section that automatically calculates the service level. This simple "decision support" tool is optional (in fact, the SoPHIELabs Classroom implementation of the game provides an option to include the calculator or not). My reason for providing it is that for a Normal demand distribution, service-level calculation is not straightforward but is required for the optimal solution. Therefore, by providing it, I eliminate one potential explanation of the observed suboptimal behavior. This clarifies that people make suboptimal decisions not because they cannot calculate the optimal service level, but rather because they choose to use a suboptimal service level. I usually also display play *history*—a summary of what happened in previous rounds—for transparency.

Figure 1. (Color online) Example of the screen in the newsvendor game.

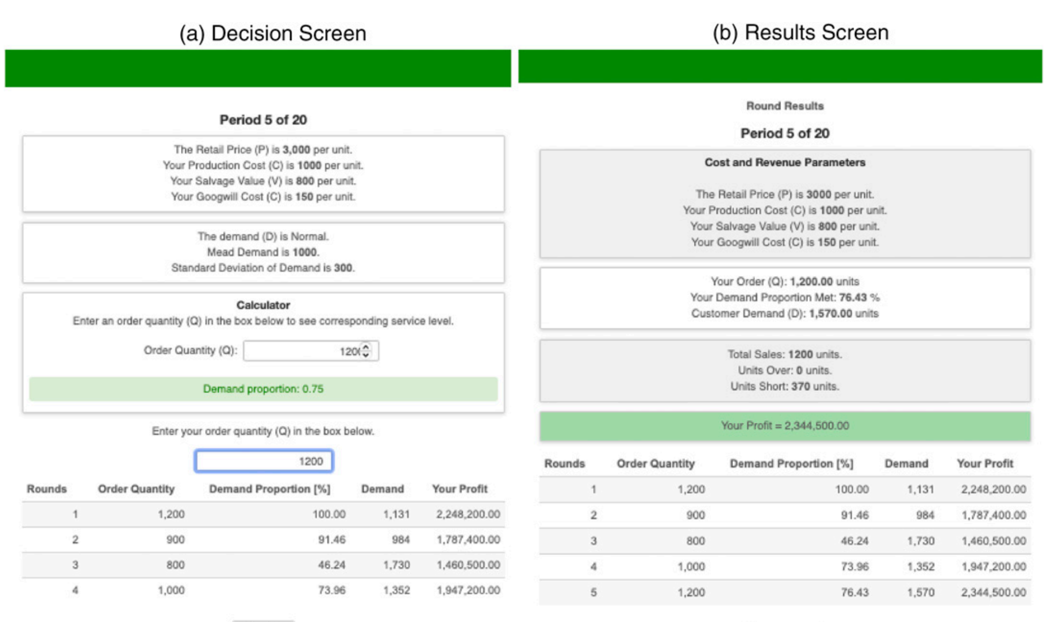
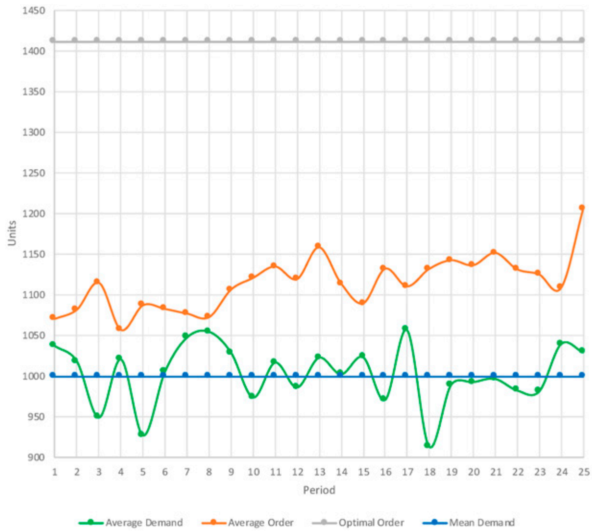


Figure 2. (Color online) Newsvendor game performance summary.



Overall Performance	
Order	1,114.68
Demand	1,003.17
Optimal Order	1,411.00
Service Level	62.73%
Optimal Service Level	91.47%
Profit	1,702,316.38
Optimal Profit	1,897,011.52
Loss	10.26%

Students play this game before learning the newsvendor model. I have them play during the lecture (but the game can also be assigned as part of the homework), and I start the discussion by showing students a chart that summarizes their performance, such as in Figure 2.

The pull-to-center effect is always present in these results and serves as a way to motivate learning the optimal solution. The report automatically calculates the profit that would have resulted from using the optimal solution and the average percentage loss (10% in Figure 2). The percentage loss can be significantly higher.

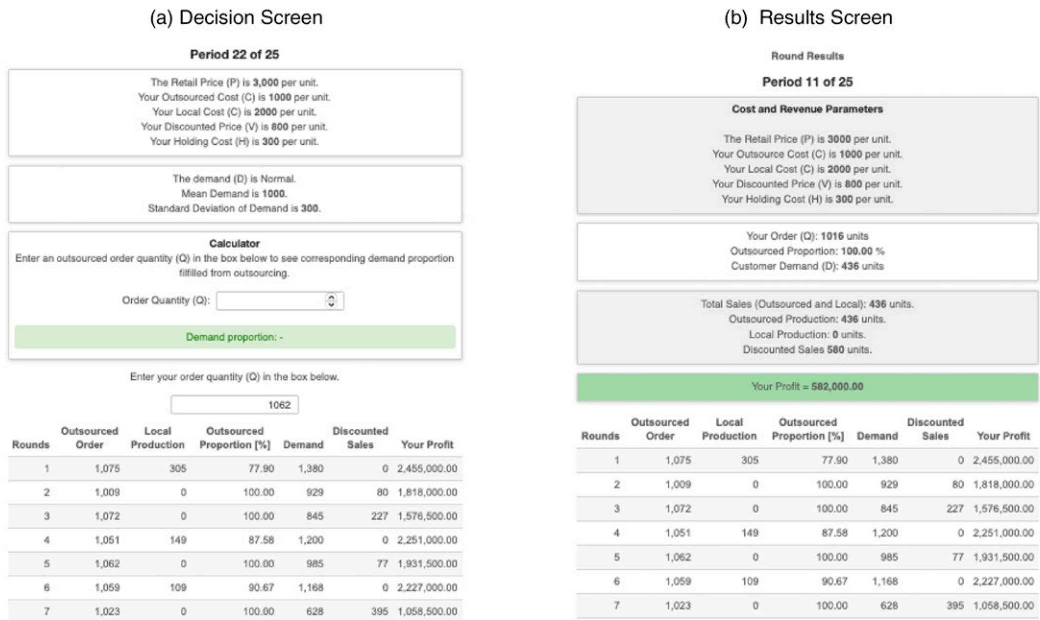
2.2. The Dual Sourcing Game

The newsvendor game can be stand-alone, or it can be part of a sequence. For example, to teach about managing supply risk, I use a case study I have written (Katok [8]) that discusses the advantage of dual sourcing and uses the dual sourcing game.

> **Box 2: The Dual Sourcing Game**
> The *dual sourcing game* works the same way as the newsvendor game except that supply comes from two sources: outsourced and local. When the initial order is smaller than the demand, the remaining units are produced by a local supplier at a cost that is higher than the outsourced cost but lower than the retail price. So the consequence of ordering too few units is the difference in the cost of the two sources instead of the lost sales and the lost goodwill. The objective of the game is the same as in the newsvendor game—to determine the order quantity that maximizes the player's profit.

The decision in the case is whether to contract with a high-cost local supplier able to deliver quickly, in addition to the low-cost regular supplier. The game follows the case and lets students experience 25 decisions. Because I use the dual sourcing game in conjunction with the newsvendor game, I designed the user interface to be very similar, as in Figure 3. The point of the case and the game is to demonstrate that dual sourcing has three benefits: (1) improved customer service by eliminating lost sales, (2) lower optimal orders from the regular supplier because the cost of underage is lower, and (3) the expected profit function is flatter, making the system more resilient not only to supply disruptions but also to ordering mistakes. This is demonstrated in the example report in Figure 4: profit loss as a result of suboptimal ordering is only about 5%.

Figure 3. (Color online) Example of the screen in the dual sourcing game.



2.3. Contracting Games

Introducing the concept of dual sourcing is one extension of the newsvendor problem. Another extension is to discuss double marginalization and contracts.

To this end, I use the wholesale price game and the buyback game (Katok and Wu [9]).

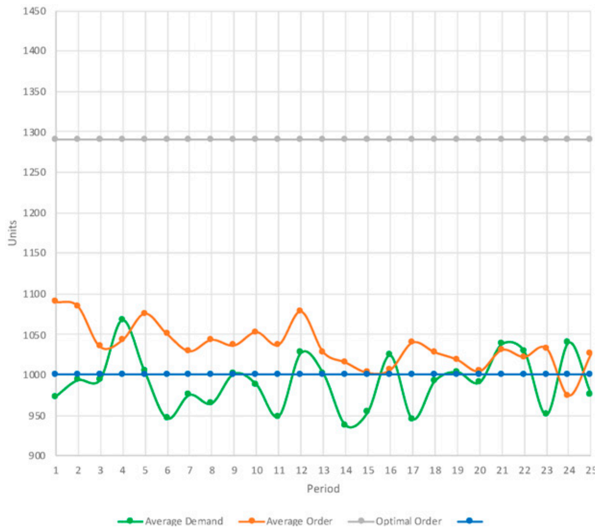
> **Box 3: The Wholesale Price and Buyback Games**
>
> In the *wholesale price game* and the *buyback game*, the player is in the role of a supplier to a retailer who is a newsvendor. The retailer is programmed to order optimally, and the student's task is to set the wholesale price (in the wholesale price game) or the wholesale price and the rebate (in the buyback game) to maximize profit. The supplier incurs a production cost for each unit the retailer orders. In the wholesale price game, the supplier's profit is the number of units ordered times the difference between the wholesale price and the production cost. In the buyback game, the supplier additionally refunds the retailer the rebate amount for each unit the retailer fails to sell. The objective of the game is to set contract parameters in a way that maximizes the supplier's profit.

Figure 5 shows the ordering screen for the wholesale price game (panel (a)) and the buyback game (panel (b)). I use both games with the same parameters to make them comparable because the teaching objective is to demonstrate (1) how a contract can be used to eliminate double marginalization, resulting in the efficient solution, (2) that the risk is shared under the buyback contract, and (3) that the buyback contract provides control over profit distribution, whereas the wholesale price contract does not.

There is typically significant learning in the wholesale price game. Figure 6 shows typical reports that I use in discussing results. Under the wholesale price contract in Figure 6(a), students learn to increase wholesale prices, which results in a decrease in the order quantities in Figure 6(b). Average prices and orders at the end of the game are typically close to optimal.

The wholesale price game results can be contrasted with the buyback game results in Figure 7. These results are typical: rebates, given wholesale prices, are too low to coordinate the channel, resulting in lower than optimal orders. In fact, most students are unable to coordinate the channel with the buyback contract or even significantly improve efficiency relative to the wholesale price contract. This conclusion motivates learning how to correctly structure contracts.

Figure 4. (Color online) Performance summary for the dual sourcing game.



Overall Performance	
Average Order	1,040.93
Average Demand	1,003.46
Optimal Order	1,290.00
Local Demand Percentage	84.38%
Optimal Demand Percentage	83.31%
Average Profit	1,813,931.43
Optimal Profit	1,917,610.54
Loss	5.41%

3. Competitive Bidding

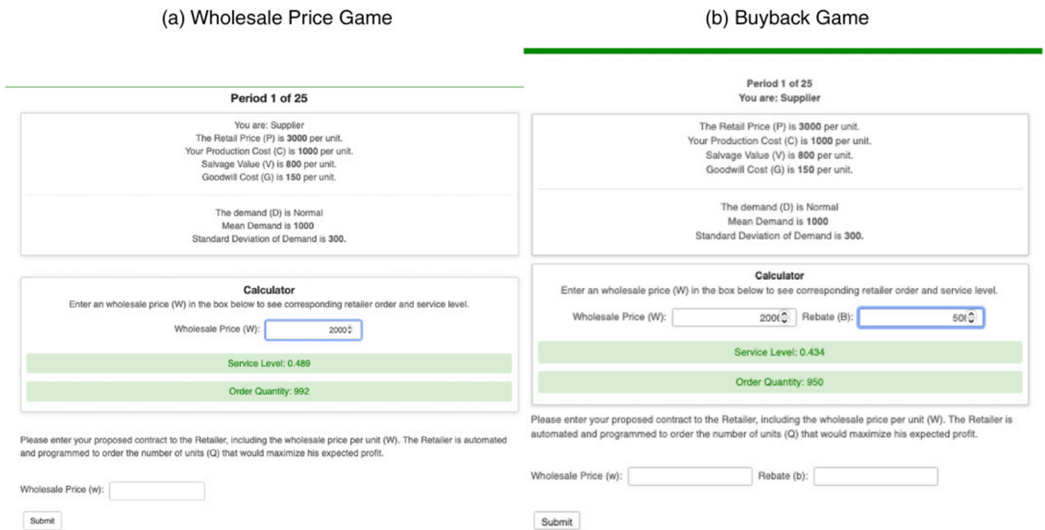
3.1. Auction Formats

> **Box 4: Reverse Auctions**
> In a reverse auction, the player is in the role of a supplier, competing against other suppliers for a contract. Each supplier knows his or her own cost of fulfilling the contract but not the cost of the suppliers. Usually, suppliers also know the distribution of the competitors' costs. During the auction all suppliers submit bids; these bids determine the auction winner, the auction winner earns the difference between the auction price and her cost, and the other suppliers earn nothing. An auction format determines how the bids are submitted, how the winner is selected, and how the bids determine the auction price. The objective of the game is to set a bid amount that maximizes profit.

There are four standard auction formats: sealed bid first price, sealed bid second price, open bid (or English), and Dutch. Vickrey [12] showed that under risk neutrality, these four formats generate the same revenue for the bid taker. This is called the revenue equivalence (Vickrey [12]). However, behaviorally, the auctions perform differently, and the complexity of bidding also differs across formats. Because four formats are too many to demonstrate, I usually get students to experience the *sealed bid auction* and the *open bid auction.* I use reverse auctions in my classes because they are more relevant for supply chain management students than forward auctions. Therefore, in these auctions, bidders are suppliers. Comparing the outcomes of the two formats leads to a good discussion.

The most time-efficient implementation of the auction games that I found is to have each student bid against automated competitors. This method has several advantages over the more straightforward way of having students bid against one another. First, the game can be assigned as homework and played asynchronously, which makes it suitable for online courses. Second, with automated bidders it is possible to vary the number of competitors, thus illustrating the effect competition has on prices. And finally, although automated competitors have costs randomly drawn from a prespecified distribution, the students can have generally low costs so that they are likely to win even auctions with many bidders. Therefore, they must think carefully about each bid. The main disadvantage of using computerized competitors is that there is no simple way to implement an open bid auction. Instead, I use the sealed bid second price auction, framed as an auction with proxy bidding, so some explanation is

Figure 5. (Color online) Ordering screens for the wholesale price and the buyback contracting games.



required up front. Figure 8 shows the Bidding screen (in panel (a)) and the Results screen (in panel (b)) for the sealed bid auction game (screens for the sealed bid second price are similar). As previously discussed, each screen contains all pertinent information, so students do not need to refer to any additional materials while playing the game.

Figure 9 shows a display that I think is quite informative because it illustrates two main lessons that I aim to teach students about auction design: first, competition leads to lower prices, and second, with few bidders, the sealed bid auction results in lower prices, which is contrary to the revenue equivalence theory.

3.2. Reservation Prices

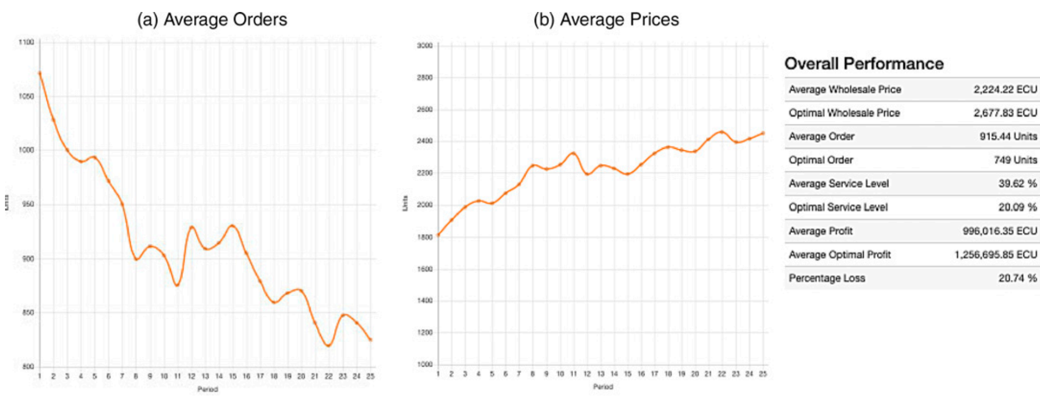
In procurement auctions the buyer must set the reservation price correctly to make sure that incumbent suppliers bid seriously. To illustrate the trade-offs involved in setting the reserve, I have students play a reservation price game (Davis et al. [2]).

> **Box 5: The Reservation Price Game**
> In the *reservation price game*, students take the role of a buyer in a reverse auction. Bidders are automated and are bidding in an open bid auction, implemented as a second price auction. If the lowest supplier cost turns out to be higher than the reservation price, the auction fails, and the buyer earns nothing. Otherwise, the auction succeeds, and the buyer's profit is the difference between his or her revenue (a fixed amount) and the contract price established by the auction. The buyer's objective is to set the reservation price in a way that maximizes profits.

In each round, the number of bidders varies. Figure 10 shows the Decision and Result screens.

The optimal reservation price does not depend on the number of bidders. Usually, although not always, students set higher reservation prices for auctions with many bidders (analogous to Davis et al. [2] for forward auctions), as in Figure 11. Reserve is less likely to matter in large auctions, so a good decision is less important when there are many bidders. This leads to the discussion of the trade-offs involved in setting the reserve price—that is, getting a lower price versus taking the chance that the auction fails because none of the suppliers can meet the reserve.

Figure 6. (Color online) Reports showing average class performance for the wholesale price game.



3.3. Trust in Auctions

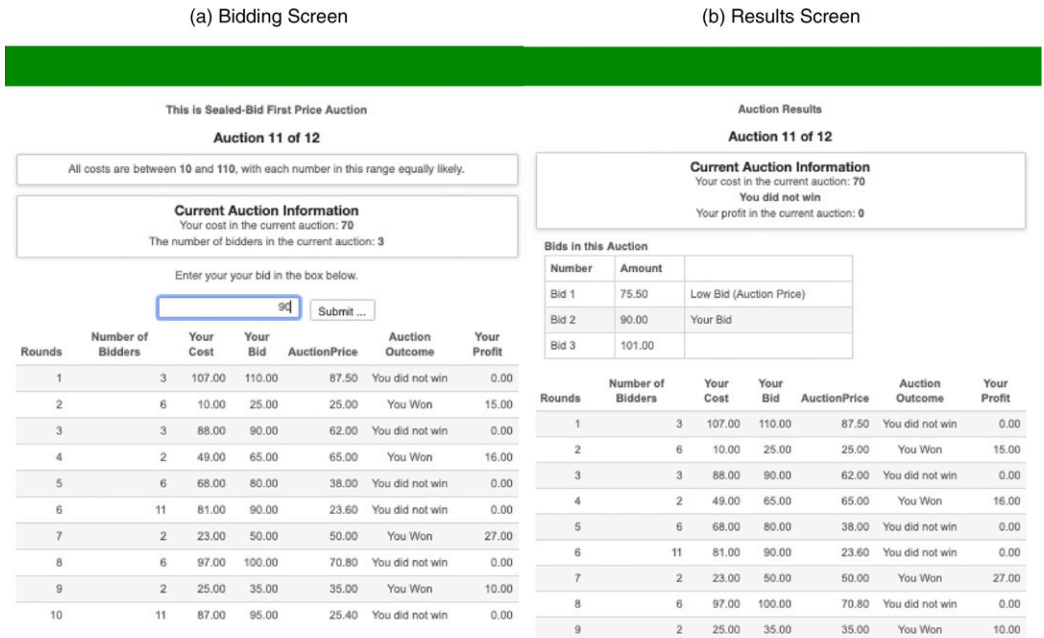
Procurement auctions are different from forward auctions in that the auction is the beginning, not the end, of the relationship, because after being awarded the contract, the winning supplier must deliver the product on time and with specified quality. Suppliers may have an incentive to cut corners if it lowers their costs, which may lead to inadequate quality. Therefore, trust is an important feature of procurement auctions. As a transition between discussing competition and trust, I have students play the trust auction game (Fugger et al. [6]).

Box 6: The Trust Auction Game

The *trust auction game* is interactive, with one student in the role of the buyer and two students in the supplier roles. The game flow is shown in Figure 13. First, the suppliers place sealed bids. Then the buyer, after observing both bids, decides whether to award the contract to one of the bidders (or the lowest bidder in the price-based auction) or to reject both bidders. If the buyer accepts one of the bids, the winner must decide on the quality level to deliver. Quality is costly for suppliers and creates value for the buyer. If the buyer rejects the trade, all players earn nothing. If the buyer accepts one of the bids, the winning supplier earns the difference between the auction price and her cost for providing the chosen quality level, and the buyer earns the value from the quality level the winner chose and the auction price. The objective of the game for all players is to maximize profits.

Figure 7. (Color online) Reports showing average class performance for the buyback game.

Figure 8. (Color online) Bidding and result screens for the sealed bid auction.



In Fugger et al. [6], the treatments vary the winner determination (price based or buyer determined) as well as the number of bidders (two or four). See Engelbrecht-Wiggans et al. [4] for a discussion of those two winner determination formats. I use two bidders because it

Figure 9. (Color online) Results for the auctions games.

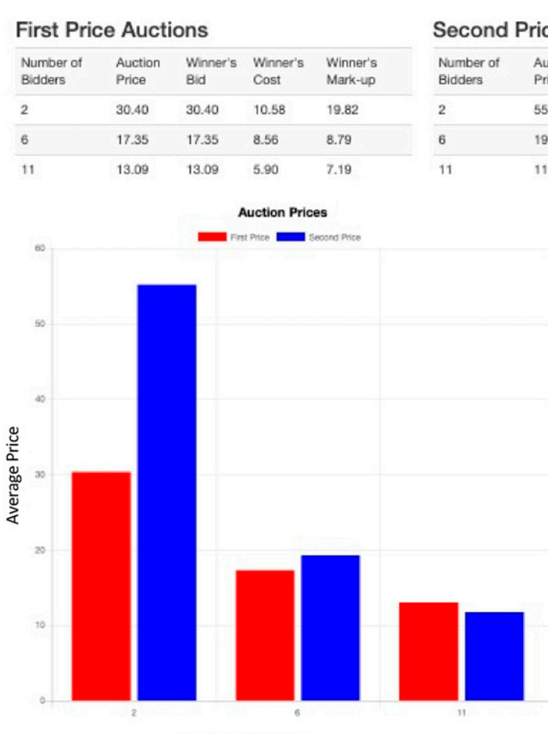
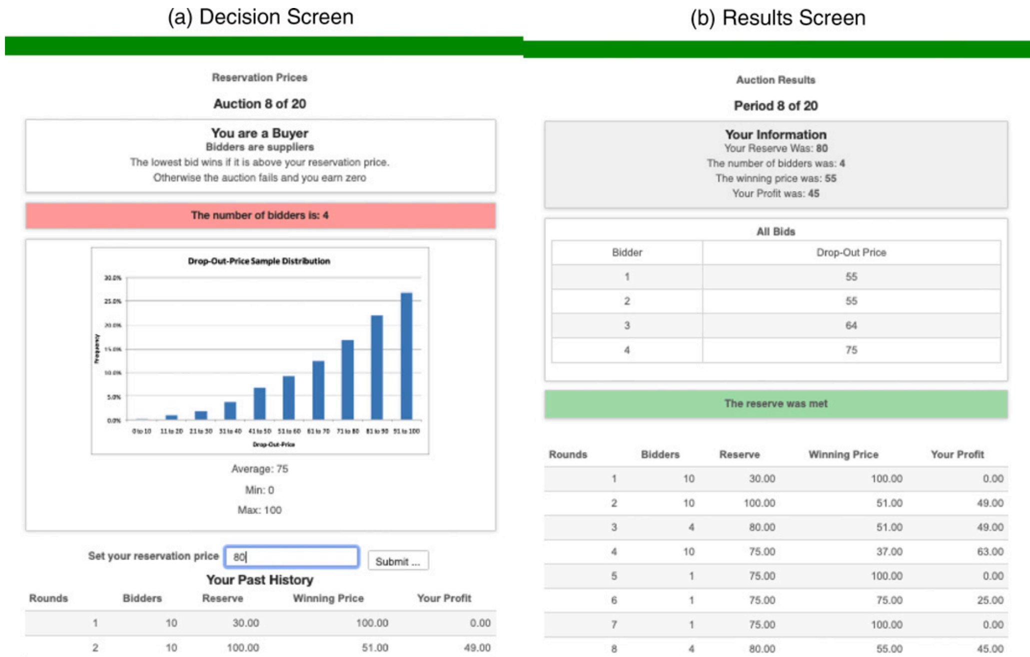


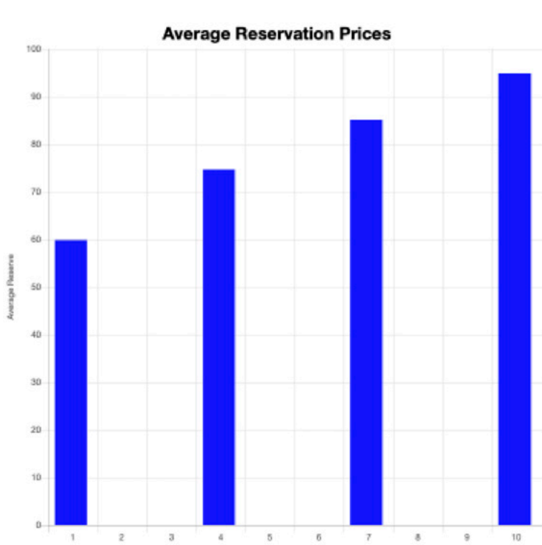
Figure 10. (Color online) Screens for the reservation price game.



makes the game faster while capturing the main lesson. Students play both the price-based and the buyer-determined versions of the game. In the price-based auction, the low bid wins automatically. In the buyer-determined version, the buyer, who is also a player, can choose either the lowest bidder or the other bidder.

In this auction, bidders' cost and buyer's value depend on the quality the winner will deliver, but the bid is placed in terms of price only. Figure 12 shows the cost structure for the

Figure 11. (Color online) Typical results for the reservation price game.



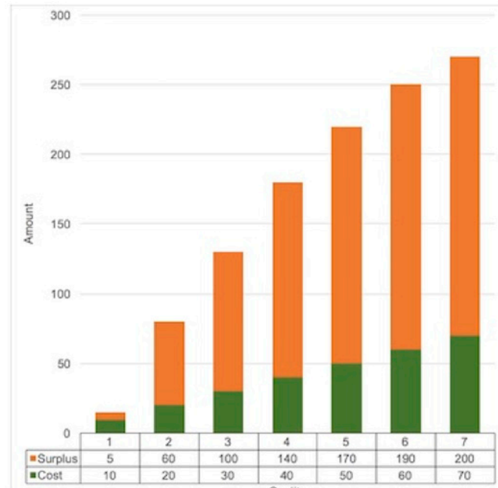
Average Profits

Number of Bidders	Average Profit	Average Reserve
1	8.79	59.92
4	29.59	74.66
7	39.38	85.18
10	45.67	94.81

Figure 12. (Color online) Cost and value information that is given to students in the trust auction game.

Cost Schedule

Quality Level	Your Cost	Buyer's Value
1	10.00	15
2	20.00	80
3	30.00	130
4	40.00	180
5	50.00	220
6	60.00	250
7	70.00	270



suppliers and the value structure for the buyer. This information is public and is shown on all the players' screens.

Figure 13 shows the flow of the game. The game starts with both suppliers entering a bid after examining the information in Figure 12. Next, the buyer observes both bids and, in the price-based auction, chooses between selecting the low bid and rejecting both bids; in the

Figure 13. (Color online) Game flow for the trust auction game.

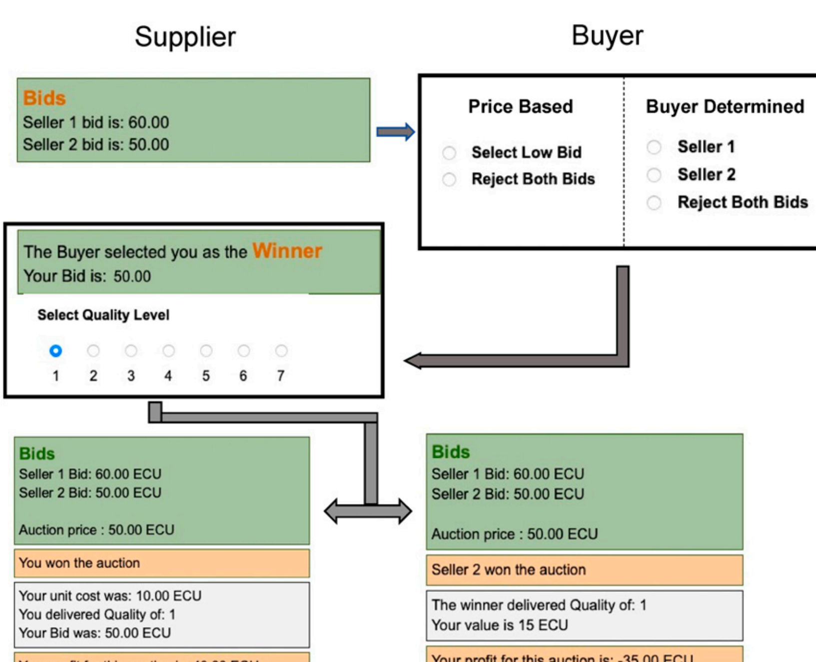
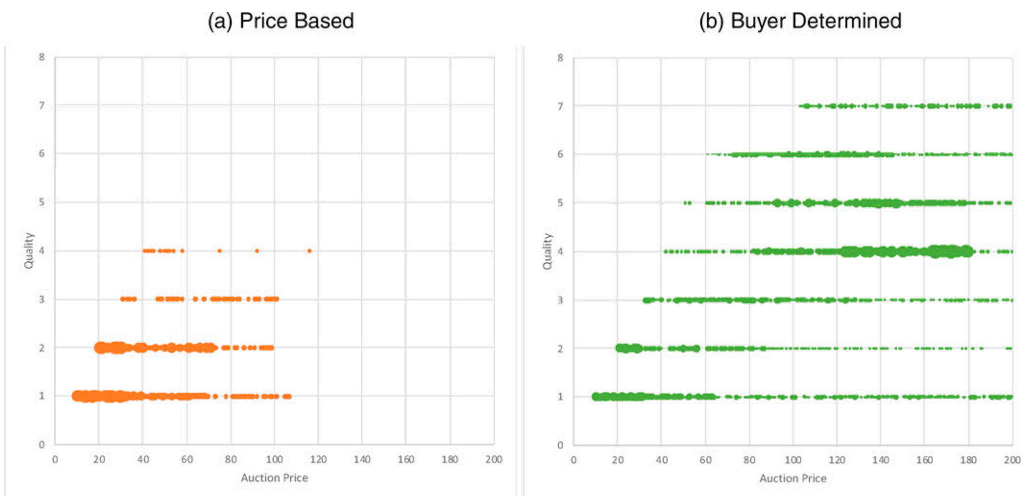


Figure 14. (Color online) Reports showing average class performance for the trust auction game.



buyer-determined auction, the buyer can also select the high bid. After the buyer decides, if the buyer selected one of the bids, the winner chooses the quality level to deliver (1–7). Finally, the profits of the players are determined according to the decisions: the winning bidder earns the difference between her price and the cost for delivered quality, the losing bidder earns 0, and the buyer earns the difference between the value associated with the quality the winner delivered and the price paid to the winning bidder. Either player can potentially lose money, although the loss is more likely for the buyer who accepted a high price but received low quality.

This game has multiple equilibria (explained in Fugger et al. [6]), which include a high-price high-quality equilibrium, which is the desirable one. In a debriefing session, I start by analyzing the price-based version of the game, which has only the inefficient, low-price low-quality equilibrium, which is typically observed, as can be seen in Figure 14(a).

The low-price low-quality outcome is not a desirable one, and in the buyer-determined auction, there is usually more collaborative behavior, as we can see in Figure 14(b). These outcomes lead to a discussion of why efficiency is desirable and how to promote efficient outcomes, as well as how to split efficiency gains. Some groups can achieve high levels of efficiency, whereas others do not. We try to highlight the reasons for the differences, which usually involve talk of trust, reputation, and fairness.

4. Trust and Collaboration

The trust auction game naturally leads to the discussion of trust and information sharing. To illustrate this, I use the forecast sharing game, which is a radically simplified version of the game from Özer et al. [10].

In this game, the retailer has the dominant strategy to tell the supplier that the demand is high, because the retailer does not incur any overage cost but benefits, on average, when production is higher. Knowing this, the supplier should ignore the retailer's signal and produce two units. Therefore, the supplier's *trust* can be measured by the average production quantity after receiving the high forecast from the retailer, whereas the retailer's *trustworthiness* can be measured by the proportion of the time the retailer told the supplier that the demand is low. Figure 16 shows a typical report after the completion of the game, showing the measures of trust and trustworthiness for each of the 10 rounds of the game. In the session shown in Figure 16, about 74% of the time, retailers truthfully reveal low demand, which is a substantial

Box 7: The Forecast Sharing Game

In the simplified version of the *forecast sharing game*, customer demand can take one of three levels (1, 2, or 3). The players are the retailer and the supplier, and neither knows exactly what the demand will be. Both players know, however, that the demand distribution can be one of two types: high or low, with equal probability. The high-type demand is a 2% probability of one unit, 33% probability of two units, and 65% probability of three units. The low-type demand is 65% probability of one unit, 33% probability of two units, and 2% probability of three units. As can be seen in Figure 15(a), the retailer knows the demand type, whereas the supplier does not. In the game, the retailer moves first and, after observing the demand type, sends the supplier a forecast, which takes the form of "High" or "Low." This forecast need not be truthful. The supplier, as can be seen in Figure 15(b), observes the retailer's forecast and decides whether to produce one, two, or three units. Production cost is 1, the wholesale price is 2, and the retail price is 3. The supplier does not ship units to the retailer until demand realization is known. Sales are, as usual, the minimum of production and demand, so the retailer earns $(3-2)\times \textit{Sales}$, whereas the supplier earns $2\times \textit{Sales} - 1\times \textit{Production}$. Both players know the earnings that result from any combination of realized demand and production, as is shown in Figure 15(b). At the end of each round, both players find out the actual demand and the resulting earnings. The objective for both players is to maximize profits.

amount of trustworthiness. Suppliers produce, on average, 2.44 units following the forecast of high demand—they trust about half the time.

In a debriefing session we first go over the game-theoretic solution as discussed in the preceding. The results always involve much more trust and trustworthiness than the equilibrium solution. Importantly, some groups can sustain much more collaboration than others. This usually leads to the discussion of when and how information can and should be shared, the importance of reputation, and systems used in practice for collaboration, such as Collaborative Planning, Forecasting, and Replenishment and simpler implementations of it.

5. Conclusion

Laboratory experiments lend themselves well to creating classroom games. Simple games that take only 10–15 minutes of class time have several benefits: they engage students, give them a reason to attend class, and are an effective and fun way to demonstrate concepts. Simple games are relatively easy to create using an online platform such as SoPHIE or oTree. Classroom games can often be developed based on games used for research, but it is important to modify research versions of games to make them classroom-friendly. Table 1 summarizes the

Figure 15. (Color online) Decision screens for the forecast sharing game.

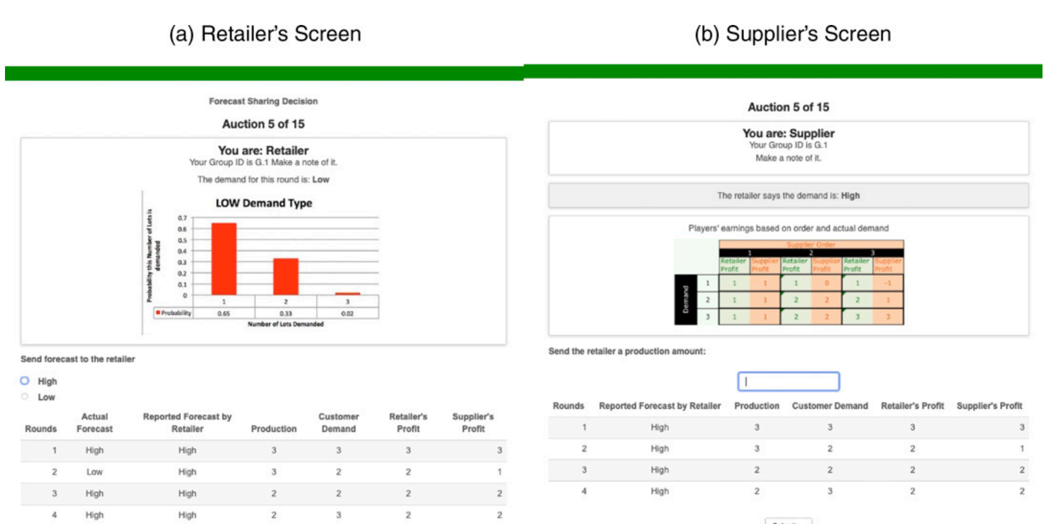
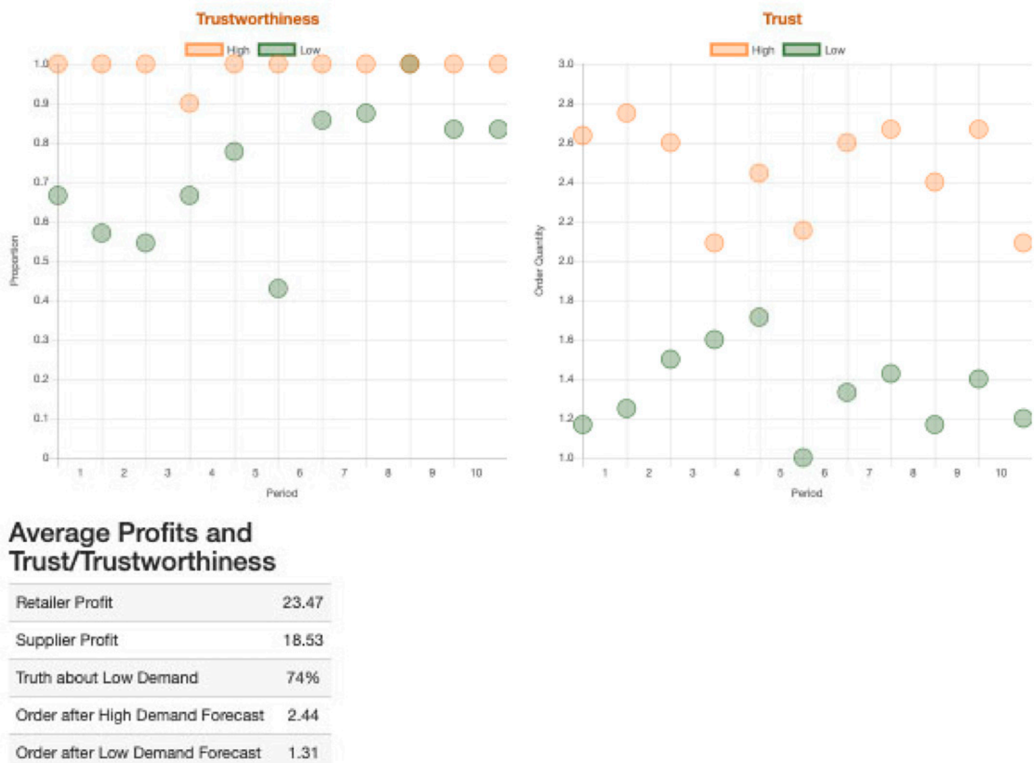


Figure 16. (Color online) Results of a forecast sharing game.



Retailer Profit	23.47
Supplier Profit	18.53
Truth about Low Demand	74%
Order after High Demand Forecast	2.44
Order after Low Demand Forecast	1.31

Table 1. Summary of the classroom games described in this paper.

Game	References	Intended audience	Concepts	Lessons
Newsvendor	Schweitzer and Cachon [11]	Undergraduates, MS, MBA	Stochastic inventory, critical ratio	Cost-benefit trade-offs
Dual sourcing	Katok [8]	Undergraduates, MS, MBA	Outsourcing, supply risk	Supply chain resilience
Wholesale price and buyback	Katok and Wu [9]	MS, MBA	Double marginalization	Channel coordination
Reverse auctions	Vickrey [12], Engelbrecht-Wiggans et al. [4]	MS, MBA	Revenue equivalence, auction formats	Auction formats affect outcomes
Reservation prices	Davis et al. [2]	MS, MBA	Reservation prices	The risk-benefit trade-off, competition
Trust auctions	Fugger et al. [6]	MS, MBA	Buyer-determined auctions	Competition and cooperation trade-offs
Forecast sharing	Özer et al. [10]	Undergraduates, MS, MBA	Information sharing	Trust in supply chains

Note. MS, master of science; MBA, master of business administration.

games I described in this article, related references, the intended audience, as well as key concepts and lessons.

Classroom games can also be used to illustrate concepts to industry partners. Most of the caveats I mention here about making classroom-friendly games also apply to industry settings. If anything, time is even more of an issue there, and lessons should be very sharp.

Complicated games, such as the beer game or some other sophisticated simulations that have been designed to run over multiple class sessions, have their place because they are more realistic than simple games. Therefore, this is not an “either-or” choice. Different game types can be used for different purposes.

References

[1] D. L. Chen, M. Schonger, and C. Wickens. oTree—An open-source platform for laboratory, online, and field experiments. *Journal of Behavioral and Experimental Finance* 9(C):88–97, 2016.

[2] A. M. Davis, E. Katok, and A. M. Kwasnica. Do auctioneers pick optimal reserve prices? *Management Science* 57(1):177–192, 2011.

[3] M. L. Duch, M. R. P. Grossman, and T. Lauer. *z-Tree unleashed*: A novel client-integrating architecture for conducting z-Tree experiments over the internet. *Journal of Behavioral and Experimental Finance* 28(December):100400, 2020.

[4] R. Engelbrecht-Wiggans, E. Haruvy, and E. Katok. A comparison of buyer-determined and price-based multi-attribute mechanisms. *Marketing Science* 26(5):629–641, 2007.

[5] U. Fischbacher. z-Tree: Zurich toolbox for ready-made economic experiments. *Experimental Economics* 10(2):171–178, 2007.

[6] N. Fugger, E. Katok, and A. Wambach. Trust in procurement interactions. *Management Science* 65(11):5110–5127, 2019.

[7] A. Hendriks. SoPHIE—Software platform for human interaction experiments. Working paper, University of Osnabrük, Osnabrük, Germany, 2012.

[8] E. Katok. Santa Fe Bicycle (B). Case study, University of Texas at Dallas, Richardson, 2022.

[9] E. Katok and D. Wu. Contracting in supply chains: A laboratory investigation. *Management Science* 55(12):1953–1968, 2009.

[10] Ö. Özer, Y. Zheng, and K.-Y. Chen. Trust in forecast information sharing. *Management Science* 57(6):1111–1137, 2011.

[11] M. Schweitzer and G. Cachon. Decision bias in the newsvendor problem: Experimental evidence. *Management Science* 46(3):404–420, 2020.

[12] W. Vickrey. Counterspeculation, auctions, and competitive sealed tenders. *Journal of Finance* 16(1):8–37, 1961.