

Exploring Supply and Demand Dynamics:

Insights from a Classroom Game on the Market for Apples

Louise Holm



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School of Public Administration, University of Gothenburg
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School of Public Administration Working Paper Series
2023:37

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ISSN 1651-5242

PREFACE

Louise Holm is a PhD in Economics and a university lecturer in Public Administration at the School of Public Administration, University of Gothenburg. The present working paper is a study focusing on higher education pedagogical development work. The empirical investigation is based on a classroom game (or experiment) conducted within the framework of an introductory course in economics on the Bachelor's program in Public Administration.

This working paper introduces an innovative classroom activity, "The Apple Market," inspired by Holt's pit market (1996). The game effectively simulates market pricing by integrating the fundamental principles of supply and demand. Students are assigned dual roles as both sellers and buyers, and their common goal is to reach a mutually agreed-upon price that optimizes their consumer and producer surplus.

"The Apple Market" not only brings economic theory to life but also enriches the learning experience in introductory courses in economics. The activity promotes a deeper understanding of how real economic forces shape prices and quantities allocated in the market. It also gives students the opportunity to witness the direct consequences of changes in supply and demand on market prices. Classroom activities like this also capture students' attention and increase their engagement in the course. My belief is that actively applying economic theory in a classroom environment promotes active learning and contributes to students' understanding of economics.

JEL: A2, D41

Keywords: teaching in economics, demand and supply, active learning, classroom experiment, educational tool.

INTRODUCTION

A course in economics can often seem technical and theoretical, potentially making it more challenging for students than anticipated. However, incorporating experiments and games into the classroom setting allows students to establish connections between economic theories and real-world markets, as well as various decision-making environments. By actively participating as market players in these experiments, students can experience the forces of economics in action, making the course topics more engaging and facilitating comprehension. As the field of economics studies behaviours and interactions among individuals in economically relevant situations, an interactive student will be able to experience the problems and phenomena encountered by such an agent. DeMartino (2007) highlights how economics and psychology have historically had strong connections and how psychological insights can be applied within economics to better understand the behaviors and decision-making of actors. The underlying concept of the experiment described in this working paper is to cultivate an economic mindset among students by imparting economics education as a laboratory science. The aim is for the student to learn much more about economic principles through their experiences as participants in an experiment and their analyses as observers, compared to relying solely on literature.

Traditional teaching in economics

The teaching technique in basic economics at universities and colleges may vary depending on the institution, the level of the course, and the specific objectives of the course; however, it is typically conducted as follows.

Depending on the focus, there may be an emphasis on the utilisation of mathematics and statistics to formulate and test economic hypotheses. Occasionally, guest lecturers from the business world are invited to share their practical experiences and insights with the students. Assessment of

student's performance often includes examinations, essays, projects, and oral presentations. Instructors may also concentrate on linking the subject matter to current events in the news and economic issues to enhance its relevance to the students. In some economics courses, laboratories may be available, where students employ statistical software and databases to analyse economic data and perform econometric analyses. Nonetheless, the majority of the teaching frequently consists of passive lectures and exercises.

Research on this area

One of several sources of inspiration for developing the teaching in the course FH1117 Economics, 15 credits, has been John Biggs and Catherine Tang's book *Teaching for Quality Learning at University*. Biggs & Tang (2011) encourage educators to understand students' prior knowledge and backgrounds and to adapt teaching to meet individual needs. They promote the idea that teachers should carefully plan and structure their lessons to promote active learning and engage students. They also emphasise the importance of creating a learning environment that fosters high-quality learning and reflection among students. The authors recommend that teachers use a variety of teaching methods and activities to keep students engaged and support different learning styles. They support teaching that focuses on encouraging deep learning rather than just surface learning.

In his book, *Learning to Teach in Higher Education* (2003), Ramsden also emphasises the importance of carefully planning and designing teaching, including setting goals, designing activities, and assessment methods. Ramsden also believes that teaching should be student-centred, considering students' needs and learning styles, and that as a university teacher, one should have a continuous commitment to improving teaching methods to promote student learning and development.

The utilisation of games aligns with the educational philosophy of active learning and constructivism. Kohn (1997) argues that deep understanding of a subject can be fostered when students are actively engaged in their learning process. Classroom experiments not only engage students but have also demonstrated various benefits, such as enhancing performance on exams and receiving positive teaching evaluations. For instance, Frank (1997) found that students who participate in experiments related to homework topics exhibit increased scores in homework assignments compared to a control group. Emerson & Taylor (2004) conducted a study measuring learning outcomes in college economics courses, revealing a significant improvement in scores when incorporating eleven exercises, as opposed to standard lectures used in control sections. Dickie (2004) also conducted experiments in three microeconomics classes, incorporating seven experiments in one group while using a control group. The experimental group exhibited significantly greater improvements in scores. According to the findings of Freeman et al. (2014), active learning sections demonstrated a notable enhancement of approximately 6 percent in average examination scores compared to traditional lecturing. Moreover, the study revealed that students enrolled in classes employing active learning methods were 1.5 times less likely to fail in comparison to those in traditional lecture-based classes.

Heineke & Meile (2000) have provided guidelines for developing effective games, emphasising the importance of obtaining an "aha" effect, where insights gained from the game are revealed only during gameplay. These games should require students to generate data themselves, promoting a deeper understanding of the subject matter. Furthermore, the games should be low stress for students and employ simple materials.

Apart from the goal of facilitating students better and easier grasp of economic theory, the incorporation of active learning through classroom experiments can also enhance students' interest in attending lectures. Several articles have shown that attending lectures positively

impacts students' learning performance. Lukkarinen, Koivukangas, & Seppälä (2016) conducted a study at a university where class attendance was not mandatory and found evidence linking class attendance to improved performance, even when controlling for other potentially related variables. Kirby & McElroy (2003) explored the relationship between attendance and grades in first-year economics courses, discovering that class attendance, particularly tutorial attendance, had a positive impact on grades, while working hours in part-time jobs had a significant negative effect.

Classroom experiments involving students as participants in a simulated “market” setting, with half designated as buyers and the other half as sellers, were first described by Chamberlin in 1948. These experiments aimed to demonstrate the inefficiency of markets. Chamberlin provided students with numbered cards, designating some as buyers and others as sellers. The students were then instructed to interact and negotiate with each other, with sellers attempting to sell above the number on their card and buyers aiming to purchase below the number on their card. Notably, Chamberlin had a student named Vernon Smith who was the first to demonstrate that an improved market structure, where traders had better information about each other's decisions, led to more efficient market outcomes. Smith was eventually awarded the Sveriges Riksbank Prize in Economic Sciences in Memory of Alfred Nobel in 2002 for his contributions. In 2002, Smith shared the prize with psychologist Daniel Kahneman, who is widely cited in economics literature for integrating insights from psychological research into economic science, particularly in the areas of human judgment and decision-making under uncertainty.

This paper aims to illustrate the implementation of a classroom game inspired by Holt's (1996) pit market concept. I will therefore first briefly explain the game by Holt.

Holt's pit market

Holt's article revolves around an educational exercise in the field of economics, utilising a straightforward trading scenario to illustrate the fundamental principles of supply and demand. This exercise emulates trading on an exchange or marketplace, engaging students in dual roles as both buyers and sellers.

The exercise is structured as follows: Students are divided into equal-sized groups of buyers and sellers. Each buyer is assigned a “red” playing card (hearts or diamonds), while each seller receives a “black” playing card (clubs or spades). Buyers can generate earnings by purchasing at prices below the value denoted on their cards, whereas sellers can generate income by selling at prices exceeding the cost represented on their cards. Buyers and sellers engage in price negotiations, and once consensus is reached, they proceed to a registration desk where the agreed-upon price is verified, announced, and recorded on the whiteboard.

Buyers exhibit demand that is completely insensitive to price above a specified threshold (the value on their card), while sellers present supply that is entirely insensitive to price below a certain threshold (the cost on their card). This results in stepped supply and demand curves. Students engage in multiple brief trading sessions with one another. Subsequently, an analysis of the outcomes and price dynamics is conducted, allowing students to independently grasp the fundamental tenets of supply and demand.

The primary objective of this exercise is to explain to students the mechanics of market operations, clarifying how prices and quantities are adjusted through negotiation. It also serves to demonstrate that a market can achieve efficient and competitive outcomes even in the absence of a substantial number of traders, dispelling the notion that participants in trade must possess precise knowledge of the competitive equilibrium price.

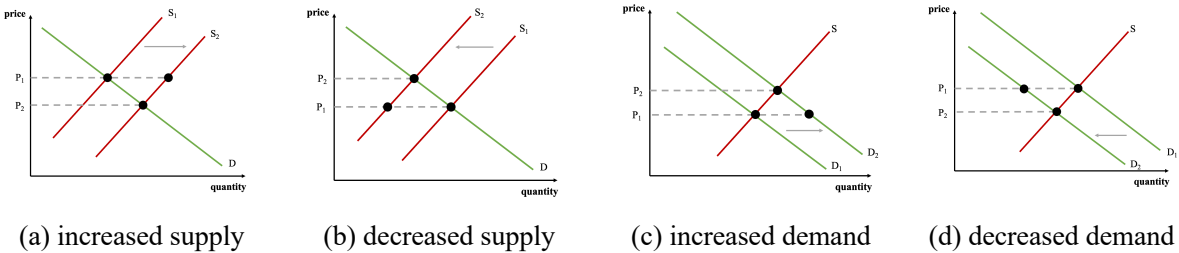
While Holt used playing cards to assign buyer and seller values in a pit auction, my game employs apples as the market good and imaginary money as payment. In my game setup, students are also assigned the roles of buyers and sellers. They are tasked with engaging in transactions to exchange apples, thereby gaining insights into market behaviour through simulation. In the game “Market for Apples”, there is also an opportunity to incorporate changes in supply and demand. These shifts in supply and demand can pose a challenge for students who are new to economics, and my research indicates that this aspect of the game is crucial for their understanding.

THE CLASSROOM GAME: MARKET SIMULATIONS

I prefer to refer to my classroom games as experiments because it signals that we do not know in advance what will happen. Even though I have covered the economic theory during the lectures beforehand, students are unaware of the specific focus or learning outcomes of this game or experiment.

Traditionally, the theory of supply and demand is taught by the instructor explaining the factors, in addition to price, that influence the quantity supplied and demanded. It is described that both supply and demand can increase (shift to the right) or decrease (shift to the left) depending upon market dynamics, thereby giving rise to four fundamental scenarios. An increase in supply results in a reduced equilibrium price in the market, while a decrease in supply leads to a raised equilibrium price. Similarly, an increase in demand leads to a raised equilibrium price, and a decrease in demand results in a reduced equilibrium price. Figure 1 illustrates these four market outcomes. The reason equilibrium prices decrease in scenarios (a) and (d) is the resulting surplus in supply. When the quantity supplied exceeds the quantity demanded, producers will reduce their supply and lower prices until a new equilibrium is reached. In scenarios (b) and (c), the reason equilibrium prices increase is the resulting surplus in demand. When the quantity demanded exceeds the quantity supplied, producers will increase their supply and raise prices until a new equilibrium is achieved.

Figure 1. Illustrating shifts of supply and demand



The experiment to be explained comprises four trading sessions. In the initial two sessions, no market-altering events transpire. However, in the third session, an event occurs that negatively impacts supply, which should consequently result in an increased equilibrium price. It is aimed to simulate the situation in Figure 1 (b). The fourth session witnesses an event that decreases demand, potentially leading to a reduced equilibrium price in the market (Figure 1 (d)).

For those seeking to include all four market scenarios, the experiment can easily be extended with two additional sessions that illustrate an increased supply (a) and an increased demand (c). The rationale behind commencing the experiment with two sessions in which no market fluctuations occur is twofold: it furnishes a baseline price for comparison in rounds three and four, and it allows students to become acclimated to the negotiation process. Furthermore, if they initiate as buyers, they are afforded the opportunity, in Round 2, to assume the alternate role of a seller.

The decision of whether to incorporate these market activities before or after the introduction of supply and demand principles is subjective and dependent on the instructor's preference. I preferer to conduct them one or two days after the lecture on supply and demand in an introductory microeconomics course. It is also important to cover consumer and producer surplus before the experiment starts.

The set up

The students should be divided into two groups: sellers and buyers. The buyers must be informed not to purchase apples at prices higher than p_B , where $p_B > 0$. This represents the maximum price the buyers are willing to pay and is unknown to the sellers. Conversely, the sellers should be instructed not to sell apples for less than p_S , where $p_S < p_B$. This represents the minimum price the sellers are willing to accept and is unknown to the buyers. Each seller is provided with an apple to be sold in the market. The teacher also provides both the maximum price and the minimum price and makes sure that the opponent does not see what the price is.

Once the market opens, students will engage in transactions by mingling around the classroom, attempting to buy or sell an apple. It is important to note that each student should only engage in a single transaction before returning to their seats and completing the earnings record sheet outlined in Table 1.

Table 1. Earning record sheet (handed out to students)

<i>round</i>	<i>buyer / seller</i>	<i>buyers' maximum price p_B / sellers' minimum price p_S</i>	<i>market price p_i</i>	<i>surplus / loss</i>
1				
2				
3				
4				
<i>total game score</i>				

The earning record sheet serves as a tool for students to document their participation as buyers or sellers in each round. They are required to enter their respective maximum price (p_B) if they are buyers or minimum price (p_S) if they are sellers, as well as the agreed market price (p_i) for each transaction. Additionally, they need to calculate their individual surplus or loss from the transaction. The consumer surplus, representing the buyer's game score for transaction i , is calculated using Equation 1, while the producer surplus, representing the seller's game score, is calculated using Equation 2.

$$p_B - p_i = \text{game score for buyer} \qquad \text{Equation 1}$$

$$p_i - p_S = \text{game score for seller} \qquad \text{Equation 2}$$

For instance, if a buyer's maximum price is 130 and they agree on a price of 70, the consumer surplus would be $130 - 70 = 60$. Similarly, if a seller's minimum price is 20 and they agree on a price of 70, the producer surplus would be $70 - 20 = 50$. Both buyers and sellers have the opportunity to achieve a positive surplus. To incentivize students to actively participate in

transactions, a negative penalty score is assigned if they do not buy or sell an apple in the current round. To maintain motivation and encourage active engagement throughout the game, the teacher may collect the earning record sheets at the end and reward a valuable prize to the student with the highest total game score, which is the sum of all surpluses in the last column of Table 1.

Upon completion of all transactions in each round, the teacher collects the agreed prices (p_i) and displays them on the board. The mean (P) and, optionally, the standard deviation (s) can be calculated for each round, particularly if multiple rounds are played. Observing the standard deviation over subsequent rounds may reveal a decrease as students converge toward an average price closer to the midpoint between the buyers' maximum and sellers' minimum.

When the game is repeated, sellers become buyers and buyers become sellers, providing each student with a new experience and the opportunity to observe the market mechanism from a different perspective.

Shifts of supply and demand on the market

Supply decreases in Round 3

Illustrating shifts in supply and demand on the market, the students are informed after the second round that there will be a significant decrease in the price of pears. As a result, some of the buyers in the apple market will switch to the pear market, assuming that apples and pears are substitute goods. Approximately one third of the buyers are selected and informed that they have moved to the pear market. To maintain the participation of these students, who are now buyers of pears, they all become sellers of apples instead. Consequently, in this round, there will be fewer buyers than sellers, and some sellers will be unable to sell an apple due to the inability to form pairs.

Demand decreases in Round 4

In the final round, the students are informed that apple production has suffered a loss due to fungus in apple trees. Similar to Round 3, a number of sellers will become buyers in this round. As a result, there will be more buyers than sellers, and some buyers may be unable to purchase an apple.

As a rule of thumb for Round 3 (Round 4), it is suggested to reduce the number of buyers (sellers) by approximately 30 percent. This adjustment is likely to result in a decrease (increase) in the average price, thereby illustrating the underlying economic theory. While the buyers' maximum price and sellers' minimum price can be altered in each round, maintaining consistent conditions may enhance the overall learning experience.

Gather results during the game

Throughout the game, it is advisable for the teacher to meticulously record all agreed-upon prices and calculate the average prices for each round. These values should be prominently displayed on a board or visual aid for all participants to observe and analyse.

After the completion of each round, the teacher should engage the students in comprehensive discussions regarding the outcomes. For instance, following Rounds 3 and 4, students can be encouraged to represent the results graphically. By prompting them to analyse the alterations in the supply and demand of apples, identify the specific factors driving these changes (such as alterations in consumer preferences, technological advancements, or input costs), and evaluate the subsequent effects on prices, students can deepen their understanding of the market's adjustment process toward a new equilibrium.

By adhering to these guidelines and maintaining an academically rigorous approach, teachers can effectively demonstrate the dynamics of supply and demand, fostering an engaging and informative learning environment.

EMPIRICAL RESULTS

The empirical results are related to the variation in students' behaviours and the different phases of the experiment. The empirical data forming the basis of the experiments was gathered during the spring semester of 2019 at the Department of Public Administration, Gothenburg University. These experiments were conducted as part of the course FH1117 Introduction to Economics, which carries a credit value of 15 hp.

Table 2. Results from experiments with Group A, B and C

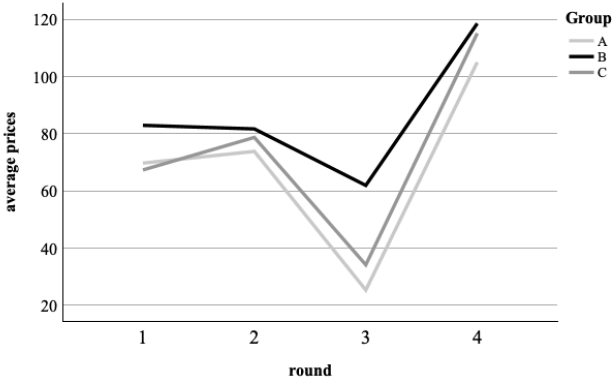
	Group A Round				Group B Round				Group C Round			
	1	2	3	4	1	2	3	4	1	2	3	4
<i>agreed price (p)</i>	150	75	13	100	95	45	30	100	90	75	40	115
	90	50	45	100	150	115	24	110	45	90	30	135
	30	60	30	150	100	100	65	130	80	65	30	130
	50	75	20	95	70	165	50	130	100	90	17	110
	60	95	19	90	100	65	75	50	55	50	50	120
	13	90	30	100	45	70	110	117	75	50	25	80
	55	70	20	100	50	75	50	130	50	60	45	130
	99	68			80	50	55	150	50	75	20	116
	130	50			35	60	100	150	70	100	50	100
	20	105			100	45	60		90	95		
					80	90			55	120		
					90	100			45	85		
									70	68		
<i>number of transactions (Q)</i>	10	10	7	7	12	12	10	9	13	13	9	9
<i>average price (P)</i>	69.7	73.8	25.3	105.0	82.9	81.7	61.9	118.6	67.3	78.7	34.1	115.1
<i>standard deviation (s)</i>	46.3	18.4	10.6	20.2	31.0	34.9	27.4	30.6	18.8	20.5	12.6	17.1
<i>buyers' maximum price (p_B)</i>	130	130	130	130	130	130	130	130	130	130	130	130
<i>sellers' minimum price (p_S)</i>	20	20	20	20	20	20	20	20	20	20	20	20

This study consists of three distinct experiments involving groups of 20, 24, and 26 students, respectively. The results obtained from these experiments are presented in Table 2. In the initial two rounds, Group A, comprising 20 students, was divided evenly into 10 sellers and 10 buyers.

In Round 3, the number of buyers decreased to 7, while the number of sellers increased to 13. In Round 4, the dynamics were reversed, with 13 buyers and 7 sellers. Table 2 provides a comprehensive overview of transaction prices, number of transactions, average prices, standard deviations, buyers' maximum prices, and sellers' minimum prices across all rounds and groups.

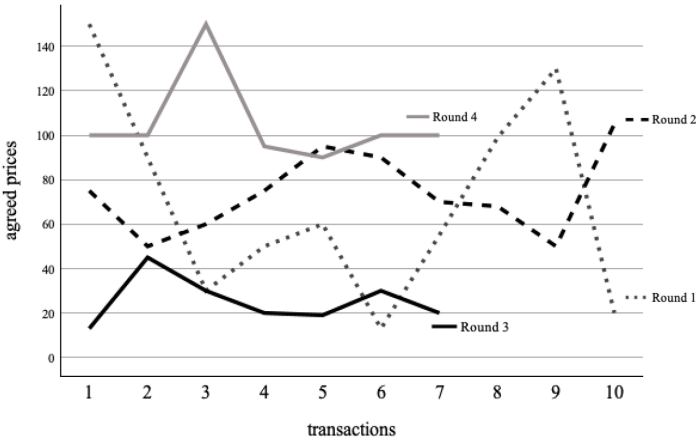
Throughout the game, the maximum prices for buyers and the minimum prices for sellers remained constant, set at $p_B = 130$ and $p_S = 20$, respectively, although these values were unknown to the participants on the opposing side of the market. The average prices observed in Rounds 1 and 2 exhibited some variation, falling within the range $P \in [67.3, 82.9]$. Additionally, as indicated in Table 2, all three experiments involving Group A, B, and C showed a decline in average prices in Round 3 compared to Rounds 1 and 2. Furthermore, the average prices in Round 4 increased relative to the initial two rounds. These findings were anticipated due to the price drop of pears in Round 3 and the occurrence of a fungus in the apple trees in Round 4. A graphical representation of these trends can be found in Figure 2, where it is evident that the average prices remained relatively consistent at around 75 in Rounds 1 and 2. Notably, the average prices decreased in Round 3 and increased in Round 4 for all three groups. For a more detailed examination of transaction prices within a specific group, Figure 3 illustrates the data for Group A. The dotted line represents Round 1, and a comparison with the second round (depicted by the dashed line) reveals a greater disparity between the prices in Round 1 compared to Round 2. The standard deviation for Round 1 was higher at 46.3, whereas it decreased to 18.4 in Round 2. Group B and C did not exhibit the same reduction in standard deviation. However, it is plausible that they would have displayed a similar pattern had the experiments continued over multiple rounds.

Figure 2. Average prices from Group A–C classroom game (Gothenburg University, spring semester 2019)



Although students were instructed not to accept prices below 20 or above 130, Figure 3 demonstrates that some students violated this rule. Nevertheless, this deviation did not undermine the purpose of the experiment. In Rounds 1 and 2, it only had a negative impact on their game score. In Round 3, where the number of sellers exceeded the number of buyers, some sellers may have realised that a slight negative surplus was preferable to incurring a significantly larger penalty score if their apples remained unsold, leading to a sense of desperation. In Round 4, where the distribution of sellers and buyers was reversed, it is possible that a desperate buyer accepted a price exceeding the instructed maximum of 130 to avoid incurring a larger negative penalty score. Out of the 121 transactions, the instructed maximum price was exceeded seven times, while the sellers' minimum price was undercut four times.

Figure 3. Data from Group A classroom game (Gothenburg University, spring semester 2019)



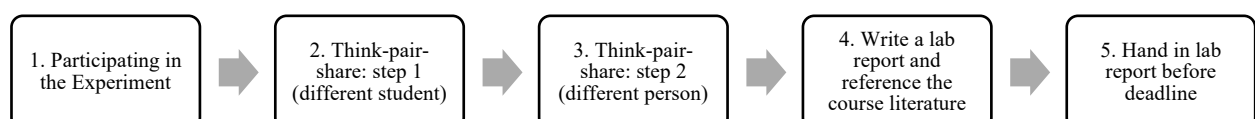
Post-Lab Work

The results of the experiment also contribute to a submission task where students are expected to explain and reflect upon what has transpired and how it can be explained using economic theory. The purpose is to convey a deeper understanding of how firms and households behave in the market, and through the experiments, we also have the opportunity to investigate the extent to which people actually conform to the theory.

After each experiment, I encourage students to engage in activities that promote reflection and learning. They are to utilise the Think-Pair-Share (TPS) technique, which is a useful strategy for fostering reflection. Think-Pair-Share is a collaborative strategy where students work together to solve a problem or answer a question about a given topic. This technique requires students to (1) think individually about a subject or respond to a question and (2) share ideas with their classmates. First, they are to reflect on what they have learned and explain this understanding to at least one other student in the class. Together, they engage in discussions to review the day's experiment. Subsequently, they are to explain this understanding to at least one other person who is not taking the course (such as a family member or friend).

Following the TPS strategy, they will write a “lab report” (a brief memorandum) about the experiment. What occurred? What were the outcomes? How can these be linked to economic theory? They should make use of and refer to the course literature (which is crucial). They are encouraged to compare the experimental results with the theoretical predictions found in the course literature.

Figure 4. Think Pair Share and lab report instructions



When writing their lab reports, they organise their thoughts about what happened. Additionally, they are required to reflect on their personal experience, such as stating: “Before concluding today's experiment, I thought...” and “After completing the experiment, my understanding has changed/not changed because...”

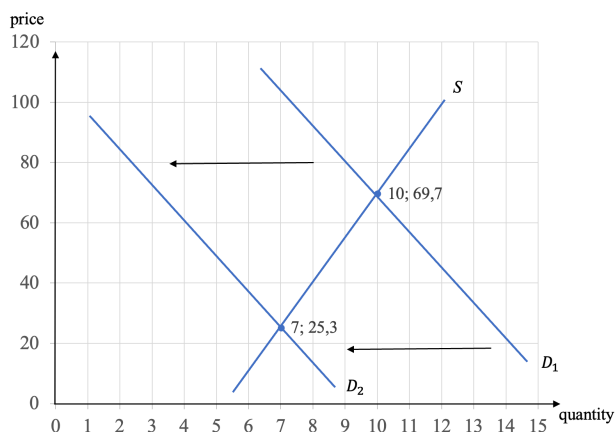
Lastly, they will provide a form of classroom assessment based on the experiment: “The most important thing I learned today was...” and possibly also “What remains unclear to me is...”. Finally, they will assign a rating between 1 (lowest) and 5 (highest) to the experiment and lecture, along with a justification for their rating. The basis for the rating is the degree of their understanding and their learning. They are not expected to rate the teacher.

CONCLUSIONS

In Rounds 1 and 2, the students swiftly grasp the incentives driving buyers, the market's consumers, to push down the price in order to maximise their consumer surplus. Conversely, they learn that sellers, the market's producers, aim to raise the price as much as possible to maximise their producer surplus. They recognise that the market price emerges as a result of agreement between buyers and sellers, both of whom benefit from this arrangement. This understanding of surplus and the cooperative nature of the perfect competitive market constitutes a crucial aspect of economic theory, and the students have the opportunity to experience it first hand through their roles in the game.

Round 3 presents the students with a supply surplus caused by a decrease in market demand. They observe that the average market price has decreased compared to Rounds 1 and 2, and this decline occurs without any explicit instructions from the teacher to lower prices. This outcome often surprises some students, and the teacher can illustrate the decrease in market demand by using average prices and the number of transactions. Through this exercise, students grasp the concept that a decrease in demand leads to a supply surplus, which in turn affects the price. Figure 5 provides an illustrative example.

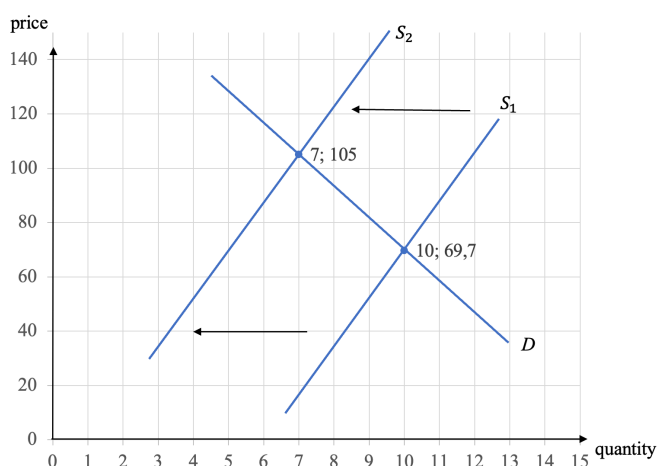
Figure 5. Decrease in market demand leads to lower market price



In Round 4, the students encounter a demand surplus resulting from a decrease in market supply. They discover that the average market price has increased compared to Rounds 1 and 2, once again realising that this change occurs without any explicit instructions from the teacher to raise prices.

Similarly, the instructor can illustrate Round 4 by presenting a demand curve and two supply curves (Figure 6). This graphical representation will demonstrate how a decrease in supply results in a lower quantity and a higher equilibrium price. By utilising the average prices and the number of transactions at each situation, students can establish a clearer connection between the outcomes of the experiment and the graph. This visual aid enhances the students' understanding and facilitates their interpretation of the experimental findings in relation to the graphical representation. By actively participating in market transactions and observing shifts in supply and demand, students develop a deeper understanding of the interplay between these factors and their impact on the market price.

Figure 6. Decrease in market supply leads to higher market price



The true insights gained from this game often become fully apparent to students only at the end, leading to a notable “aha” moment when the findings are summarised in the graphs. As suggested

by Heineke & Miele (2000), students should generate the data themselves to maximise their comprehension. The game should be designed to be low stress, utilising simple materials such as apples, in order to facilitate a more immersive learning experience.

Reflections from the students

The course *FH1117 Introduction to Economics*, offered at Gothenburg University's Department of Public Administration during the spring semester of 2019, incorporated various experiments, including the game described here. At the end of the course, students participated in a course evaluation that included a question about their overall opinion of this teaching approach. Table 3 presents the results based on feedback from 98 students.

Table 3. Results from course evaluation

What is your total opinion on the experiments (i.e., that form of teaching)?

	frequency	percent	cumulative percent
<i>very negative</i>	0	0	0
<i>negative</i>	0	0	0
<i>neutral</i>	17	17.3	17.3
<i>positive</i>	39	39.8	57.1
<i>very positive</i>	42	42.9	100
<i>total</i>	98	100	

Several students who took the course provided comments specifically regarding this experiment:

“This type of exercise generates more knowledge than a regular lecture.”

“I think it was a tremendously instructive experiment because it becomes much easier for me personally to understand when you get more handy examples of how things work. You got to see why the market can change and what it depends on in different cases. Really rewarding.”

“This was a fun experiment that meant that I gained more understanding of how supply and demand work, and how the market can be affected so clearly because of different events. Everyone wanted to earn the highest game score and was committed. This also demonstrates the importance of competition in a market. Overall, I am happy with the experiment and think it is fun to have such activities instead of just lectures. I look forward to the next experiment!”

“It was very instructive to be a producer and a consumer in the different situations, because when you can experience it you understand it in a completely different way compared to if you had only read this from a book or if it was explained on a lecture.”

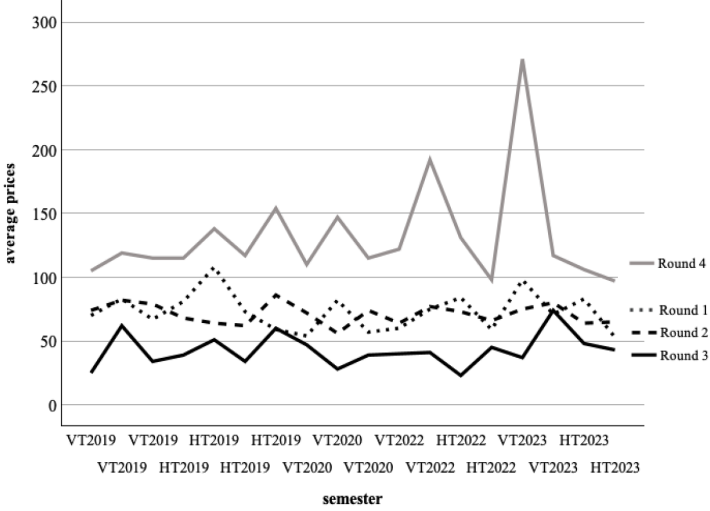
Several comments were also about them getting a fun experience they won't forget.

Reflections from the teacher

My experience, from teaching economics for 24 years and incorporating classroom experiments for 5 years, is that students have diverse learning styles. By introducing multiple practical components where students can practice skills related to course objectives in ways other than traditional methods, students' interest, and motivation to participate in the instruction increase. Participation in teaching, in turn, enhances examination outcomes. I am convinced that the benefit of incorporating practical components into theoretical courses and delivering high-quality, engaging instruction that also impacts student learning, is very significant. I believe this active way of learning will remain in the student's memory long after the course ends.

Given the initial success of the experiment, it has become a consistent and integral component of the course. Figure 7 displays the results from all semesters, starting from the spring of 2019. An analysis of the data reveals that Round 3 exhibits a noticeable increase in average prices, whereas Round 4 demonstrates a decrease. In contrast, Rounds 1 and 2 exhibit comparable average prices that fall within an intermediate range.

Figure 7. Average prices from experiments between spring (VT) 2019 and fall (HT) 2023



I firmly believe that when economic concepts are solely taught at an abstract level, students perceive these concepts as disconnected from real-world phenomena, rendering them seemingly irrelevant. According to Biggs & Tang (2011) a deeper learning is preferred to a surface learning. One way to achieve deep learning is to better understand the subject matter. I believe that by experiencing the outcomes generated by the theories in the field, learning becomes deeper.

My perception is that students understanding of the subject, in relation to the course objectives, has significantly improved thanks to various classroom experiments in the course. Upon reviewing the outcomes of the experiments, students' express relief. They now comprehend how the curves discussed in the lectures are interconnected with buyers, sellers, price, and the quantity allocated in the market. They understand that events can influence the market equilibrium state. In my view, students now have a much better grasp of how the market is affected by events, and they find it much easier to respond to questions similar to Exercise 1 below.

Exercise 1

Discuss, based on fundamental supply and demand analysis, how the price developments on the soda market are influenced by the following event. Responses should be justified with a diagram and include a brief explanatory text.

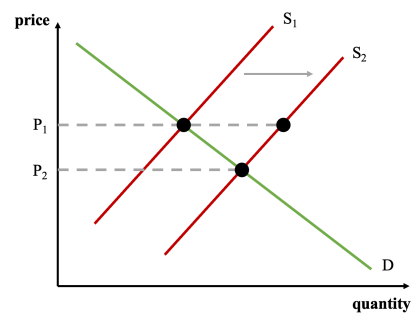
- The soda market. The price of sugar, one of the ingredients in soda, is decreasing.

Solution to exercise 1

If the price of sugar, one of the production factors for soda, decreases, the production costs of soda will decrease. This leads to an increased supply in the market.

When supply increases (and the curve shifts to the right), there is an excess supply at the prevailing price. This means that the quantity supplied is higher than the quantity demanded at this price (P_1). This will lead producers to lower the price, and they continue to do so until the quantity supplied equals the quantity demanded, i.e., at the price where the supply curve equals the demand curve. We have reached a new equilibrium at a lower price (P_2).

Figure 8. Shift in supply



It is such a fun way not only to learn, but also to teach

Finally, I firmly believe that incorporating experiments into the classroom environment is not only an enjoyable way for students to acquire knowledge but also an effective method for educators to impart that knowledge. Experiments have the remarkable ability to engage students actively, fostering a deeper understanding of the subject matter. They transform learning into an interactive and hands-on experience, where students can explore, question, and learn from direct experiences. Moreover, experiments encourage critical thinking, problem-solving, and teamwork, all of which are valuable skills that extend beyond the classroom. When both students and educators embrace the use of experiments, it creates an exciting and dynamic learning environment that benefits everyone involved.

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