

**FIRST VS THIRD DEGREE PRICE DISCRIMINATION IN THE  
LABORATORY**

An Undergraduate Research Scholars Thesis

By

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## **ABSTRACT**

First vs. Third Degree Price Discrimination in the Laboratory. (May 2013)

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Differential pricing is a contentious issue within the business environment. The public's reaction to price discrimination varies widely from discontent to indifference. I hypothesize that buyers who do not benefit from price discrimination will perceive that it is unfair and reject discriminatory offers from sellers. Using a laboratory experiment, I use differing degrees of price discrimination to test the validity of this prediction. I represent buyer and seller interactions with a modified version of the ultimatum game to model consumers' perception of fairness. I find that the treatment effect is not significant in determining how buyers will behave. In addition, sellers price higher in third degree situations than in first degree situations. My results indicate that consumers are unlikely to change their behavior in the face of price discrimination even when sellers price aggressively.

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# CHAPTER I

## INTRODUCTION

Price discrimination is a fairly common occurrence. The strategy of charging customers different prices for the same item goes even farther back than newspaper coupons and student discounts at movie theaters. As commerce begins moving to the internet, price discrimination will become an increasing concern for both businesses and customers: electronic commerce companies are able to mine large amounts of data from their users that allow them to determine individual preferences, which in turn allows more elaborate price discrimination schemes. For example, the route a customer takes to find the product website might indicate what they're looking for. If the customer finds the product through a Google search, they might be searching for an average price. However, if they come from a link in a product review, they may be willing to pay more because others have vouched for the quality of the product. If they have a history of browsing price comparison and bargain sites, the customer may be willing to pay less than the average price. Brick and mortar stores in the past have not been able to utilize these strategies, but the subject of price discrimination requires greater scrutiny as the ability to do so increases with technology.

In this paper, I examine the results of repeated ultimatum game experiments designed to resemble first and third degree price discrimination seen in transactions. Specifically, I am interested in how participants' behavior changes between different degrees of price discrimination.

## **The Case of Amazon.com and Private Universities**

Many forms of price discrimination are considered undesirable. The Robinson-Patman Act of 1936 addresses the anticompetitive nature of price discrimination, and federal law expressly prohibits discrimination based on race, sex, etc. Other forms of price discrimination are unpopular, but less clear under the law. In September of 2000, the website Amazon.com was discovered to have engaged in price discrimination (Odlyzko 2003). The company implemented a system that used a buyer's browser cookies to identify individual shopping habits in order to offer identical items at different prices. The differential pricing structure the practice was immediately terminated after the backlash from unhappy consumers, who felt that it was unfairly extracting higher profits from loyal customers.

University tuition in the United States serves as a stark contrast to the Amazon example. While price discrimination was overwhelmingly unpopular in the previous example, private universities in the United States vary their tuition per student based directly on their ability to pay (Odlyzko 2003). Not only is this practice tolerated, but it is encouraged by the government through the use of the Free Application for Federal Student Aid (FAFSA).

With these two examples in mind, I believe there is a common thread of "fairness" that determines how individuals perceive price discrimination cases (Xia, Monroe, and Cox 2004). The difference here is that Amazon users feel that loyal customers are being exploited, while the private universities are aided by the federal government in providing a college education to those who otherwise might not be able to afford one.

## **Price Discrimination**

An extensive survey on the existing price discrimination literature is given by Armstrong (2006). In addition, a look at price discrimination and privacy by Odlyzko (2003) details the history of how the practice has evolved and the implications it has for the internet age.

The classifications of first and third degree price discrimination were first discussed by Pigou (1929). First degree price discrimination occurs when a monopolist charges a different price on each unit based on the maximum price every consumer is willing to pay. In contrast, third degree price discrimination is based on using a characteristics or customer segments as a proxy for individual willingness to pay. According to Carroll and Coates (1999), there are three necessary market conditions for price discrimination:

- a) The firm must have some market power and must not be price takers, implying a negatively sloped demand curve. A negatively sloped demand curve means that there is consumer surplus in the firm's transactions.
- b) The firm must control sale of their product. The firm is unable to enact differential pricing if unrestricted arbitrage is possible.
- c) Consumers have different price elasticities. When prices are changed by the firm, the quantity demanded by each individual must change at different rates, otherwise all consumers are identical.

## **The Ultimatum Game**

I use the ultimatum game to model interactions between buyers and sellers (Hoffman et. al 1994). The differential pricing interaction for between buyers and sellers can be thought of as a two part game. In the first part, the seller offers a price or a menu of prices that is shown to the buyer. The seller has information on the buyer's preferences and can change his prices accordingly. In the second part, the buyer is presented with the price and can choose to accept or reject the offer. If the buyer accepts the offer, the seller receives the price of the offer, and the buyer receives his or her redemption value of the item minus the price. If the buyer rejects the offer, both players receive nothing.

Non-cooperative game theory hypothesizes that the first player in two person bargaining games should act to gain as much surplus as possible from the second mover (Fouraker and Siegel 1963). In my case, theory predicts that sellers will raise price to minimize consumer surplus as their ability to accurately price discriminate increases. Contrary to this belief, experimental research into the ultimatum game has found that the first mover tends to make a more generous offer than the theory would predict (Fouraker and Siegel 1963), ostensibly due to the buyer's refusal to accept offers that are not in the spirit of egalitarianism. This preference for "fairness" is well-documented in the ultimatum game and appears to be an integral link between markets and social preferences.



## **Price Discrimination and Experimental Studies**

The experiment carried out by Englmaier, Gratz, and Reisinger (2012) uses a similar design to ours in order to study reciprocal responses under third degree price discrimination. I depart from their study by focusing on fairness rather than reciprocity as well controlling for differing degrees of price discrimination. There has been very little experimental research devoted to first degree and third degree price discrimination. There is also very little research concerning how consumers' fairness concerns alter the effectiveness of first and third degree price discrimination.

To test whether consumer decisions are affected by the severity of price discrimination, I will conduct two experiments that follow the structure of the ultimatum game. In the first treatment (D1), sellers will choose a price for each buyer and each item. Since two buyers are assigned to each seller, the seller will be picking fmy prices in order to model first degree price discrimination. In the second treatment (D3), sellers will only set prices for each item, but not for each buyer. This treatment is meant to model third degree price discrimination by having the seller only set two prices. I predict that consumers will react to price discrimination and respond by rejecting more offers.

## CHAPTER II

### EXPERIMENTAL METHOD

All experiments were conducted at the Economics Research Laboratory at Texas A&M University. The computer-based experiments were programmed in z-Tree (Fishbacher, 2007) and scheduled with the organizational software ORSEE (Greiner, 2004). The subjects were recruited from registered undergraduate students. Fifty-fmy subjects participated in two experimental sessions, split evenly into two groups of 27, with each subject participating in only one session.

Upon entering the lab, each participant was assigned a random number corresponding to their assigned computer station. Upon entering the program, each participant was further randomly placed into a role in a randomly assigned group. All instructions were common knowledge. Both sets of directions were read aloud by the experimenter as well as displayed on the screen.

Subjects were divided into groups of two buyers and one seller and played a single interaction game over ten periods. The groups of the participants were randomized at the beginning of each period, but their roles remained the same after the first period. Redemption values for the buyers were predetermined as follows:

|         | item A | item B |
|---------|--------|--------|
| buyer_l | 100    | 100    |
| buyer_h | 200    | 50     |

[Figure 2.1] Redemption Values for Buyers

## Seller Decision Stage

In the first stage, the sellers were given two goods and asked to set prices for the buyers, with the knowledge of the predetermined redemption value of both items for each buyer.

| Buyer Redemption Values for Items A and B  |                            |                            |
|--|----------------------------|----------------------------|
| Participant  | Redemption Value of item A | Redemption Value of item B |
| You have many units of items A and B to sell.<br>Buyers 1 and 2 have the opportunity to purchase either item A or B from you.<br>They may purchase a MAXIMUM of one item.<br>If they purchase an item it will be automatically be redeemed for points at the end of the period.<br>The redemption values are shown above.<br>What prices will you offer Buyers 1 and 2 on items A and B? |                            |                            |
| Buyer 1:   |                            |                            |
| For what price will you offer to sell Item A?  | <input type="text"/>       |                            |
| For what price will you offer to sell Item B?  | <input type="text"/>       |                            |
| Buyer 2:   |                            |                            |
| For what price will you offer to sell Item A?  | <input type="text"/>       |                            |
| For what price will you offer to sell Item B?  | <input type="text"/>       |                            |

[Figure 2.2] Example of a Seller's Decision Stage

For treatment D1, sellers were given five prices to set, as shown in Figure 2.2. In treatment D3, sellers were given two prices to set, one for each item. The prices could not be less than 0, or greater than 200, intentionally chosen to match the highest redemption value between both buyers. The seller received a profit equal to the price if the buyer chose to accept either offer, but received nothing if the buyer rejected both.

## Buyer Decision

Once sellers selected their prices, each buyer was asked to either pick one of the two offers, or to reject both offers.

| Buyer Redemption Values for Items A and B  |                            |                            |
|--|----------------------------|----------------------------|
| Participant  | Redemption Value of item A | Redemption Value of item B |
| <p>The SELLER has determined these prices specifically for you.</p> <p>Would you like to buy item A or B?</p> <p><input type="radio"/> I will buy item A at 40. My profit this period will be 160.</p> <p><input type="radio"/> I will buy item B at 30. My profit this period will be 20.</p> <p><input type="radio"/> I will not buy either item. My profit this period will be 0.</p> |                            |                            |

[Figure 2.2] Example of a Buyer's Decision Stage

The redemption values of each buyer were known to the other buyer in the same table displayed to the seller at the top of the screen. In both treatments D1 and D3, all buyers of the same type (either l or h) viewed the same decision screen. If the buyer accepted an offer, they would

receive a profit of the redemption value of the item minus the price. If both offers were rejected, the seller and the buyer would both receive nothing.

### **Payment Calculation**

The profit for sellers was determined by the price of the item accepted by each buyer, with the period's profit equal to the sum of both prices. The period's profit for buyers was equal to their redemption value for the item they accepted minus the price set by the seller. The buyer's profit would be equal to zero if they chose to reject both offers, and the seller would not receive any profit from selling to the buyer. At the end of 10 periods, each individual's payment was calculated by randomly selecting a profit period, and awarding cash based on their performance in the randomly selected period.

## CHAPTER III

### THEORY

Standard economic models mostly assume that individuals act in their own self-interest. In the case of price discrimination, a purely self-interested buyer would engage in any transaction that results in a positive outcome for them. However, there is extensive experimental evidence showing that consumers are strongly influenced by fairness concerns (Kahneman, Knetsch, and Thaler 1986). In order to evaluate these fairness concerns, I employ a model for inequity aversion from Fehr and Schmidt (1999) to describe the buyer's behavior.

$$U_i(x) = x_i - \alpha_i \frac{1}{n-1} \sum_{j \neq i} \max\{x_j - x_i, 0\} - \beta_i \frac{1}{n-1} \sum_{j \neq i} \max\{x_i - x_j, 0\}$$

[Figure 3.1] Fehr and Schmidt's Model of Inequity Aversion

I take  $U$  to represent overall utility, and the first term  $x_i$  to be the monetary payoff for player  $i$ . The second term represents the utility loss when the individual perceives inequity that puts them at a disadvantage. The  $\alpha_i$  coefficient represents the individual's inequity aversion, given the loss from disadvantageous inequality ( $x_j - x_i$ ). The third term measures the utility loss when the individual perceives inequity that works in their favor. It is nearly identical to the previous term, other than that  $\beta_i$  measures advantageous inequity ( $x_i - x_j$ ), which is the inverse of disadvantageous inequity. For this study, I assume  $\beta_i = 0$  because buyers are not given any advantageous inequity in relation to the seller (they are not allowed to set negative prices). Without a third term, my model is as follows:

$$U_i(x) = x_i - \alpha_i \frac{1}{n-1} \sum_{j \neq i} \max\{x_j - x_i, 0\}$$

[Figure 3.2] Fehr and Schmidt Modified

A buyer's condition for accepting an offer is that he gains more utility from accepting than he would from rejecting.

$$U_i(x_i) > U_i^0(x_i)$$

[Figure 3.3] Buyer's Condition for Accepting

Since the value of  $(\max\{x_j - x_i, 0\} \geq 0)$  in Figure 3.2, the utility of a rejection cannot go below zero. Therefore, I can assume  $U_i^0(x_i) = 0$ . Because my independent variable is a binary representation of acceptance or rejection, I use the logistic regression model to estimate the probability of  $\alpha$ .

$$P(\text{accept}|\alpha, \beta, \text{price}) = \frac{e^{U_i(x_i)}}{1 + e^{U_i(x_i)}}$$

[Figure 3.4] Logistic Model of Buyer's Decision

Finally, I model the seller's decision based on the buyer's condition for accepting in Figure 3.3. Since sellers are pure profit maximizers, I set their utility as equal to their profit. Profit in turn, is equal to the probability of an acceptance times the price:

$$\pi = P(U_i(x) > 0) \times \text{price}$$

[Figure 3.5] Seller's Profit Function

Sellers will set their prices in order to maximize the value of  $\pi$  in Figure 3.5.

## CHAPTER IV

### RESULTS

**Result 1: The treatment effect was not significant in determining overall buyer behavior.**

A t-test done on the buyers' decisions by treatment shows that the actions of both buyer\_l and buyer\_h did not vary significantly with different treatments:

| VARIABLES    | (1)<br>buyer_h       | (2)<br>buyer_l       |
|--------------|----------------------|----------------------|
| treatment    | 0<br>(0.0612)        | -0.0111<br>(0.0629)  |
| Constant     | 0.789***<br>(0.0967) | 0.789***<br>(0.0994) |
| Observations | 180                  | 180                  |
| R-squared    | 0.000                | 0.000                |

Standard errors in parentheses  
 \*\*\* p<0.01, \*\* p<0.05, \* p<0.1

[Figure 4.1] T-tests on Buyer Decisions

The primary result is that the tests are not consistent with my prediction of a strong response from the buyer. Since treatment is not significant in any of the tested ranges, I cannot reject the null hypothesis. Confirming this result, I found that subjects in each treatment had very similar acceptance rates even when sellers doubled their price in some instances. Furthermore the amount of total rejections per period varied little across treatments and the R-squared values are equal to 0.000.



Since every measure of the data shows no difference in the buyers' choices between treatments, I assume that the treatment effect did not affect the buyer.

**Result 2: Third degree price discrimination resulted in higher prices than first degree.**

For the purpose of this test, I used D1 as treatment = 1, and D3 as treatment = 2. I found that a higher treatment number led to higher prices, meaning that prices were significantly higher in the third degree treatment than in the first degree treatment.

| VARIABLES    | (1)<br>Price<br>buyer_h,<br>item A | (2)<br>Price<br>buyer_h,<br>item B | (3)<br>Price<br>buyer_l,<br>item A | (4)<br>Price<br>buyer_l,<br>item B |
|--------------|------------------------------------|------------------------------------|------------------------------------|------------------------------------|
| treatment    | 73.53***<br>(4.734)                | -1.144<br>(2.764)                  | 1.289<br>(6.591)                   | 37.51***<br>(2.306)                |
| Constant     | 7.300<br>(7.486)                   | 84.04***<br>(4.371)                | 151.8***<br>(10.42)                | 6.733*<br>(3.646)                  |
| Observations | 180                                | 180                                | 180                                | 180                                |
| R-squared    | 0.575                              | 0.001                              | 0.000                              | 0.598                              |

Standard errors in parentheses  
 \*\*\* p<0.01, \*\* p<0.05, \* p<0.1

[Figure 4.2] Effect of Treatment on Price

The series of t-tests shows that only two out of the four prices changed significantly between periods. Recalling the redemption values in Figure 2.1 (buyer\_h redeems item A for 200, buyer\_l redeems item B for 100), I find that the prices that vary significantly correspond to the buyers' highest redemption value, and that the sellers played optimally to maximize their profit.

In order to play optimally, the sellers set the price of item A to extract the maximum surplus from buyer\_h. Since the price of item A is too high for buyer\_l, he or she is forced to take the price charged for item B or reject both.

## **CHAPTER V**

### **CONCLUSION**

The goal of this paper was to study how different degrees of price discrimination affect a buyers' decision to engage in a transaction with the seller. Past literature on the ultimatum game shows that fairness is a concern to consumers. My research focused on applying previous experimental literature to price discrimination studies to see if consumers reacted to unfair situations in the same way.

My findings show that changing between first and third degree price discrimination has no significant effect on the buyers' behavior. This result suggests that buyers are apathetic toward fairness in this experimental setting. An explanation for this could be that they behaved in a purely selfish way and sought to maximize their profit. This may be because they felt powerless to influence a seller's behavior when the groups were always randomized. Alternatively, the presence of a second buyer may have complicated the decision by creating competition. Any number of feelings from competition to apathy could have justified accepting a non-zero payoff.

I also found that the sellers priced more optimally in the third degree treatment than the first degree treatment. This is evidenced by the higher prices shown in the D3 treatment, controlling for buyer actions. There could be a couple of explanations for these results. First, the participants in the D1 treatment may have had a harder time discovering their best strategy since they were

required to make four decisions instead of two. As a result, they may have not played as optimally as the players in the D3 treatment. Second, the structure of the predetermined redemption values helped lend itself to successful to an optimal strategy in D3. The preference for the goods was divide so that buyer\_h had a high redemption value for one item, and a very low redemption value for the other item. If the redemption values were changed to make the solution less obvious, perhaps the results would be different.

Further research should be done in a number of ways. A lot could be learned by changing individual parameters. The redemption values could be modified to see if it affects seller strategy. One of our assumptions was that sellers operated in a monopoly, which could give them more market power than practical scenarios on the internet. Two person groups might also see a different outcome. Also, previous research indicates that buyers are less likely to be sensitive to inequity from seller profits if they are competing against others. Another dimension that could be examined is how the relationships observed in this study relate to psychological behaviors. For instance, future studies could analyze whether specific character traits or psychological profiles tend to respond differently to price discrimination. Finally, our study is also limited by its focus on short-term behavior. It could be the case that over time, consumers change how they feel about price discrimination.

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## APPENDIX

### **Seller Instructions – D1**

Today, you will be participating in an economics experiment. The experiment tests how people make decisions involving money. The decisions you make in this experiment will determine your earnings, measured in points, which will be converted to cash and paid at the end of this session. You will make all of these decisions on the computer in front of you. Please pay attention to these instructions so you will understand how to make money.

If you have any questions, please raise your hand, and the experimenter will quietly answer your question. Please do not talk to any other person during this experiment.

There will be ten rounds in this experiment. At the beginning of each round, you will be randomly matched into groups of three. Each group will contain one seller and two buyers. Sellers will remain sellers throughout all ten rounds; buyers will remain buyers throughout all ten rounds. However, the grouping of sellers and buyers will be continually changing throughout the ten rounds as sellers and buyers are randomly grouped together at the beginning of each period.

In each round, the seller will determine a price to offer each buyer for each item. The buyer will then determine whether to buy an item. Sellers will receive points equal to the price of each item they sell. Buyers will receive points based on their "redemption value" for the item minus the price they pay for that item.

After ten rounds, one round will be randomly selected and buyers and sellers will receive cash based on the total number of points they acquire. Points will be converted to cash at a rate of 10 points=\$1.

The specific instructions for buyers and sellers are listed below and the specific seller (or buyer) instructions will be visible to each seller (or buyer) before the first round.

Please wait as we assure no one has any questions.

You have been assigned the role of **SELLER**. In this experiment, you have been anonymously paired with two other participants, who are **BUYERS**. The identity of either person will not be known during or after the experiment. As a seller, you have been given two types of items to sell. Your job is to offer a price for each type of item to each buyer. That is, you will choose **FOUR** prices: two prices on each of the two items for each of the two buyers. Then, each price and item will be shown to his or her respective buyer.

Each buyer has the option to buy an item at the price you have offered. The buyer may not buy both items, so he or she will buy either one of the items at the price you offered or no items at all. If a buyer buys an item, you receive an amount equal to the full price of the item. If the buyer chooses not to buy an item, you receive nothing.

Each buyer has a "redemption value" on each of the two items. At the end of each period, if a buyer buys an item he or she will receive a number of points equal to that redemption value. The buyer will not receive any points if he or she does not buy any items.

The interaction will be repeated over several periods. For each period, you will be randomly matched with two people and retain your role as a seller. At the end of the experiment, your earnings will be calculated by the points you have earned in a randomly selected period.

The other members of your group have been assigned the role of **BUYER**. They will be presented with the option to buy one of two items from a seller. They have three choices: they

may buy the first item, they may buy the second item, or not buy either item. They do not have the opportunity to buy both items.

The buyers will be assigned a redemption value for the item. If they accept an offer, they will receive points equal to the redemption value for that item, minus the price they paid for that item. For example, if their redemption value is  $x$  and the seller offers them a price of  $y$  and they accept the offer, then they will earn  $x-y$  points. If they reject the offer, the seller will receive nothing.

Sellers will earn points equal to the price of any items they sell.

Please wait until everyone has heard the instructions and the instructor has given you permission to continue.



## **Buyer Instructions – D1**

Today, you will be participating in an economics experiment. The experiment tests how people make decisions involving money. The decisions you make in this experiment will determine your earnings, measured in points, which will be converted to cash and paid at the end of this session. You will make all of these decisions on the computer in front of you. Please pay attention to these instructions so you will understand how to make money.

If you have any questions, please raise your hand, and the experimenter will quietly answer your question. Please do not talk to any other person during this experiment.

There will be ten rounds in this experiment. At the beginning of each round, you will be randomly matched into groups of three. Each group will contain one seller and two buyers. Sellers will remain sellers throughout all ten rounds; buyers will remain buyers throughout all ten rounds. However, the grouping of sellers and buyers will be continually changing throughout the ten rounds as sellers and buyers are randomly grouped together at the beginning of each period.

In each round, the seller will determine a price to offer each buyer for each item. The buyer will then determine whether to buy an item. Sellers will receive points equal to the price of each item they sell. Buyers will receive points based on their "redemption value" for the item minus the price they pay for that item.

After ten rounds, one round will be randomly selected and buyers and sellers will receive cash based on the total number of points they acquire. Points will be converted to cash at a rate of 10 points=\$1.

The specific instructions for buyers and sellers are listed below and the specific seller (or buyer) instructions will be visible to each seller (or buyer) before the first round.

Please wait as we assure no one has any questions.

You have been assigned the role of BUYER. In this experiment, you have been anonymously paired with two other participants, of whom one is a SELLER, and the other is another BUYER.

The identity of either person will not be known during or after the experiment.

As a buyer, you will be presented with the option to buy one of two items from a seller. You have three choices: you may buy the first item, you may buy the second item, or not to buy either item. You do not have the opportunity to buy both items.

You will be assigned a redemption value for the item. If you accept an offer, you will receive points equal to your redemption value for that item, minus the price you paid for that item. For example, if your redemption value is  $x$  and the seller offers you a price of  $y$  and you accept the offer, then you will earn  $x-y$  points. If you reject the offer, you will receive nothing.

Sellers will earn points equal to the price of any items they sell.

The interaction will be repeated over several periods. For each period, you will be randomly matched with two people and retain your role as a buyer. At the end of the experiment, your earnings will be calculated by the points you have earned in a randomly selected period.

Another person in your group has been assigned the role of SELLER. They will choose FOUR prices: two prices on each of the two items for each of the two buyers. Then, each price and item will be shown to his or her respective buyer.

Each buyer has the option to buy an item at the price the seller offered. The buyer may not buy both items, so he or she will buy either one of the items at the price the seller offered or no items at all. If a buyer buys an item, the seller receives an amount equal to the full price of the item. If the buyer chooses not to buy an item, the seller receives nothing.

Each buyer has a "redemption value" on each of the two items. At the end of each period, if a buyer buys an item he or she will receive a number of points equal to that redemption value. The buyer will not receive any points if he or she does not buy any items.

Please wait until everyone has heard the instructions and the instructor has given you permission to continue.

### **Seller Instructions – D3**

Today, you will be participating in an economics experiment. The experiment tests how people make decisions involving money. The decisions you make in this experiment will determine your earnings, measured in points, which will be converted to cash and paid at the end of this session. You will make all of these decisions on the computer in front of you. Please pay attention to these instructions so you will understand how to make money.

If you have any questions, please raise your hand, and the experimenter will quietly answer your question. Please do not talk to any other person during this experiment.

There will be ten rounds in this experiment. At the beginning of each round, you will be randomly matched into groups of three. Each group will contain one seller and two buyers. Sellers will remain sellers throughout all ten rounds; buyers will remain buyers throughout all ten rounds. However, the grouping of sellers and buyers will be continually changing throughout the ten rounds as sellers and buyers are randomly grouped together at the beginning of each period.

In each round, the seller will determine a price to offer each buyer for each item. The buyer will then determine whether to buy an item. Sellers will receive points equal to the price of each item they sell. Buyers will receive points based on their "redemption value" for the item minus the price they pay for that item.

After ten rounds, one round will be randomly selected and buyers and sellers will receive cash based on the total number of points they acquire. Points will be converted to cash at a rate of 10 points=\$1.

The specific instructions for buyers and sellers are listed below and the specific seller (or buyer) instructions will be visible to each seller (or buyer) before the first round.

Please wait as we assure no one has any questions.

You have been assigned the role of **SELLER**. In this experiment, you have been anonymously paired with two other participants, who are **BUYERS**. The identity of either person will not be known during or after the experiment. As a seller, you have been given two types of items to sell. Your job is to offer a price for each type of item. That is, you will choose **TWO** prices: one price on each of the two items. Then, each price and item will be shown to each buyer.

Each buyer has the option to buy an item at the price you have offered. The buyer may not buy both items, so he or she will buy either one of the items at the price you offered or no items at all. If a buyer buys an item, you receive an amount equal to the full price of the item. If the buyer chooses not to buy an item, you receive nothing.

Each buyer has a "redemption value" on each of the two items. At the end of each period, if a buyer buys an item he or she will receive a number of points equal to that redemption value. The buyer will not receive any points if he or she does not buy any items.

The interaction will be repeated over several periods. For each period, you will be randomly matched with two people and retain your role as a seller. At the end of the experiment, your earnings will be calculated by the points you have earned in a randomly selected period.

The other members of your group have been assigned the role of **BUYER**. They will be presented with the option to buy one of two items from a seller. They have three choices: they

may buy the first item, they may buy the second item, or not buy either item. They do not have the opportunity to buy both items.

The buyers will be assigned a redemption value for each item. If they accept an offer, they will receive points equal to the redemption value for that item, minus the price they paid for that item. For example, if their redemption value is  $x$  and the seller offers them a price of  $y$  and they accept the offer, then they will earn  $x-y$  points. If they reject the offer, the seller will receive nothing.

Sellers will earn points equal to the price of any items they sell.

Please wait until everyone has heard the instructions and the instructor has given you permission to continue.

### **Buyer Instructions – D3**

Today, you will be participating in an economics experiment. The experiment tests how people make decisions involving money. The decisions you make in this experiment will determine your earnings, measured in points, which will be converted to cash and paid at the end of this session. You will make all of these decisions on the computer in front of you. Please pay attention to these instructions so you will understand how to make money.

If you have any questions, please raise your hand, and the experimenter will quietly answer your question. Please do not talk to any other person during this experiment.

There will be ten rounds in this experiment. At the beginning of each round, you will be randomly matched into groups of three. Each group will contain one seller and two buyers. Sellers will remain sellers throughout all ten rounds; buyers will remain buyers throughout all ten rounds. However, the grouping of sellers and buyers will be continually changing throughout the ten rounds as sellers and buyers are randomly grouped together at the beginning of each period.

In each round, the seller will determine a price to offer each buyer for each item. The buyer will then determine whether to buy an item. Sellers will receive points equal to the price of each item they sell. Buyers will receive points based on their "redemption value" for the item minus the price they pay for that item.

After ten rounds, one round will be randomly selected and buyers and sellers will receive cash based on the total number of points they acquire. Points will be converted to cash at a rate of 10 points=\$1.

The specific instructions for buyers and sellers are listed below and the specific seller (or buyer) instructions will be visible to each seller (or buyer) before the first round.

Please wait as we assure no one has any questions.

You have been assigned the role of BUYER. In this experiment, you have been anonymously paired with two other participants, of whom one is a SELLER, and the other is another BUYER.

The identity of either person will not be known during or after the experiment.

As a buyer, you will be presented with the option to buy one of two items from a seller. You have three choices: you may buy the first item, you may buy the second item, or not to buy either item. You do not have the opportunity to buy both items.

You will be assigned a redemption value for the item. If you accept an offer, you will receive points equal to your redemption value for that item, minus the price you paid for that item. For example, if your redemption value is  $x$  and the seller offers you a price of  $y$  and you accept the offer, then you will earn  $x-y$  points. If you reject the offer, you will receive nothing.

Sellers will earn points equal to the price of any items they sell.

The interaction will be repeated over several periods. For each period, you will be randomly matched with two people and retain your role as a buyer. At the end of the experiment, your earnings will be calculated by the points you have earned in a randomly selected period.

Another person in your group has been assigned the role of SELLER. They will choose TWO prices: one price on each of the two items. Then, each price and item will be shown to each buyer.



Each buyer has the option to buy an item at the price the seller offered. The buyer may not buy both items, so he or she will buy either one of the items at the price the seller offered or no items at all. If a buyer buys an item, the seller receives an amount equal to the full price of the item. If the buyer chooses not to buy an item, the seller receives nothing.

Each buyer has a "redemption value" on each of the two items. At the end of each period, if a buyer buys an item he or she will receive a number of points equal to that redemption value. The buyer will not receive any points if he or she does not buy any items.

Please wait until everyone has heard the instructions and the instructor has given you permission to continue.