Experimental Economics

Lemon markets

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Outline for today

- Lemon Markets: Markets with asymmetric information

- Your experiment & Lab report 2

Main questions for today

1. What happens if consumers cannot observe the quality prior to purchase?

2. If there is imperfect information, how can quality be sustained?

Classic example: https://www.youtube.com/watch?v=cYcsFyim_Cs

Lemons market

What happens in a market if buyers cannot observe quality?

- Nobel prize-winning (2001) economist
  George Akerlof explains the consequences
  of quality uncertainty in his famous paper:

- "**The Market for Lemons:
  Quality Uncertainty and the Market Mechanism.**"

- wrote also popular science books on behavioral economics

  - *Animal Spirits*

  - *Identity Economics*
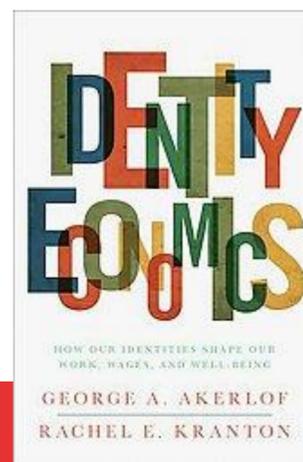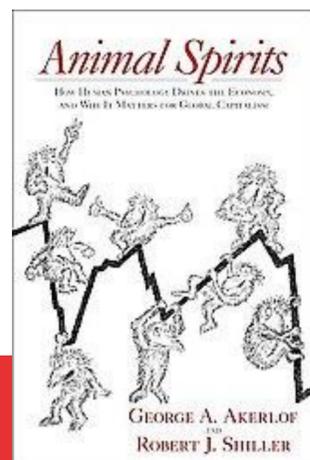
Reservation price

An owner's **reservation price** for an object is the lowest price the owner would accept.

- For example, a used-car owner keeps her car unless she is offered at least her reservation price.

- She should be willing to sell to the person who makes her the highest offer greater than her reservation price.

The classic example

- Car dealers know the problems of their cars.

- But potential buyers don't.

- Sellers may swindle unsuspecting buyers.

- Potential buyers aren't stupid… they know they **can't trust the dealers** to provide an honest evaluation of their cars.

Asymmetric information

Asymmetric information occurs when traders on one side of the market **know** things that traders on the other side do **not**.

At first, asymmetric information may not seem to be a serious problem for markets.

→ It would be cheap and easy for traders, who know things others don't, to pass this information on.

Misaligned incentives

- Does this happen in real-world markets?

- Experiment 2 showed us:

➢ Traders with detailed information may **benefit** from concealing or misrepresenting this information.

Talk is cheap

- If a buyer offers a higher price to those who say they have good cars than to those who say they have lemons…

- …lemon owners will say they have good cars (peaches).

The intuition

Buyer side

- If buyers stay in this market, they end up betting on averages.

- They pay a price that reflects the average frequency of lemons in the used car market.

→ a price **too high for a lemon**,
but **too low for a good-quality car**.

The intuition

Seller side

What is a dealer's strategy given that buyers aren't willing to pay much?

- If the dealer has a good car, she is likely not to sell the car.

- And when sellers of good cars refuse to sell…
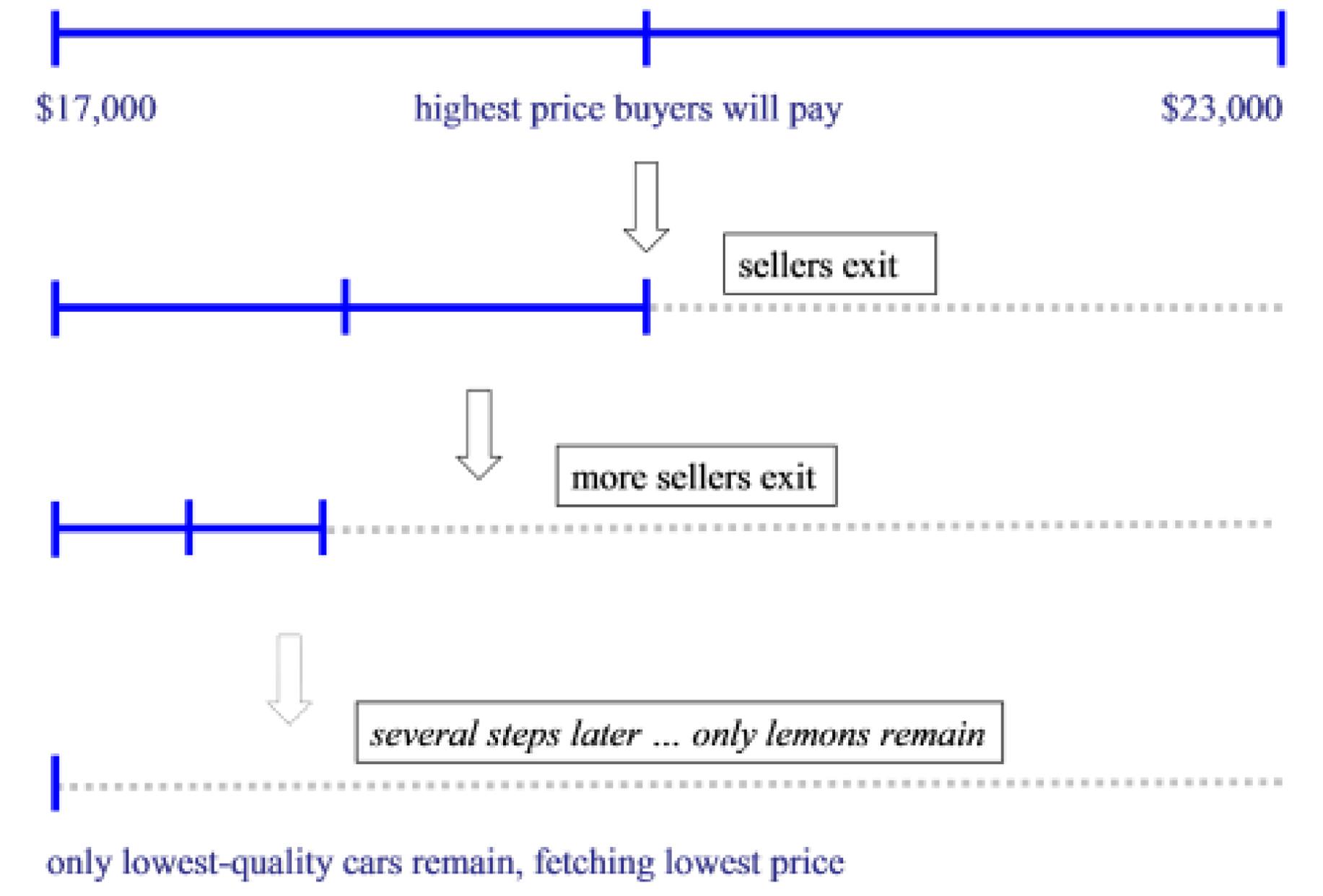
➢ Frequency of lemons increases in the market.

Market failure

There are buyers who want to buy good cars and sellers who have them to sell…but the lack of trust keeps good cars out of the market.

ONLY LEMONS CAN BE TRADED

Market failure explained in steps

$17,000   highest price buyers will pay $23,000

sellers exit

more sellers exit

several steps later … only lemons remain

only lowest-quality cars remain, fetching lowest price

The model

- Sellers choose price p and quality g

- Buyer's valuation is an increasing function of g: $V = v(g)$

- Seller's cost per unit is an increasing function of g: $C = c(g)$

- Net value of each unit: $v(g) - c(g)$

The model

- **Perfect information**: buyers can observe quality grade

- What is the market equilibrium?

- Optimal grade: $g^* = \arg\max_g [v(g) - c(g)]$

- Will competition force $g = g^*$?

The model

- **Imperfect information**: buyers cannot observe quality

- What is the market equilibrium?

$$g = g^{min} < g^*: \text{Inefficiency is created}$$

How to solve it?

- Can you think of **mechanisms** that can avoid this inefficiency?

- Formal (Standard economics):
     warranties, return policies

- Informal (Behavioral economics):
     social preferences and reciprocity

Your experiment

Consumer side

- Buyers demand at most **one unit** of a product.

- All buyers have identical valuations for a given grade g: $V_g = v(g)$

Values: $v(1) = \$4.00$

$v(2) = \$8.80$

$v(3) = \$13.60$

Your experiment

Producer side

- In each period, a seller can choose a quality grade and can offer at most **2 units** of the chosen grade.

- All sellers have identical costs per grade g and unit u: $C_g^u = c^u(g)$

Costs for the second unit are \$1 more than for the first unit:

$$c^1(1) = \$1.40; \; c^2(1) = \$2.40$$

$$c^1(2) = \$4.60; \; c^2(2) = \$5.60$$

$$c^1(3) = \$11.00; \; c^2(3) = \$12.00$$

Your experiment

Producer side

- Sellers start by choosing p and g.

- They can sell only one quality grade in each period and max. 2 units

$$\text{Seller earnings} = p(g) - c^1(g) + p(g) - c^2(g)$$

Your experiment

Consumer side

- Buyers rank purchase preferences.

- Buyers shop **simultaneously**.

$$\text{Buyer earnings} = v(g) - p(g)$$

Experimental design

- 2 treatments
  1. full information
  2. asymmetric information

- 5 periods per treatment

- 7 sellers

- 10 buyers

Full information treatment

➢ Endogenous product quality + full information on quality

▪ Sellers see all other sellers' prices and grades after choosing their own price and grade.

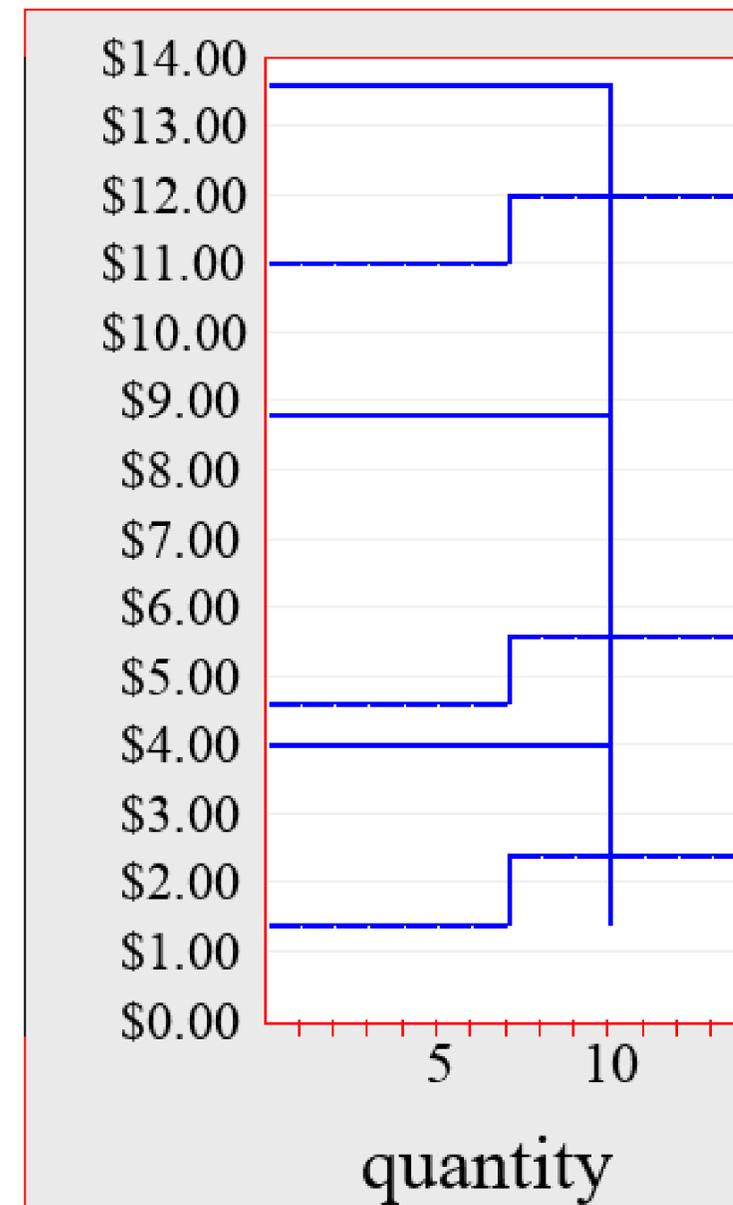▪ Buyers see prices and grades for all sellers before making purchases.

Lab report 2

- Any questions about demand/supply curves?

- What was the most difficult part?

Lab report 2:

Questions 1-3

Grade	1	2	3
Seller cost of 1st unit	1.40	4.60	11.00
Seller cost of 2nd unit	2.40	5.60	12.00
Buyer value	4.00	8.80	13.60

- $CS_1 = Q_1^*(v(1) - P_1^*) = 10(\$4 - \$2.4) = \$16$
- $CS_2 = Q_2^*(v(2) - P_2^*) = 10(\$8.8 - \$5.6) = \$32$
- $CS_3 = Q_3^*(v(3) - P_3^*) = 10(\$13.6 - \$12) = \$16$

- $PS_1 = Q_1^1(P_1^* - C_1^1) + (Q_1^* - Q_1^1)(P_1^* - C_1^2)$
- $PS_1 = 7(\$2.4 - \$1.4) + 3(\$2.4 - \$2.4) = \$7$
- $PS_2 = Q_2^1(P_2^* - C_2^1) + (Q_2^* - Q_2^1)(P_2^* - C_2^2) = \$7$
- $PS_3 = Q_3^1(P_3^* - C_3^1) + (Q_3^* - Q_3^1)(P_3^* - C_3^2) = \$7$

- $TS_1 = CS_1 + PS_1 = \$23$
- $TS_2 = \$39$
- $TS_3 = \$23$

Lab report 2:

Question 4:
What if cost for each seller's first unit
for grade 2 increases by $0.25?

Grade	1	2	3
Seller cost of 1st unit	1.40	4.85	11.00
Seller cost of 2nd unit	2.40	5.60	12.00
Buyer value	4.00	8.80	13.60

The profits for grade 2 compared to the profits for **other** grades will ___**decrease**___ (decrease/increase). The equilibrium grade is ___**two**___ (one/two/three). **The convergence** to the equilibrium in the experiment might be ___**slower**___ (the same/slower/faster).
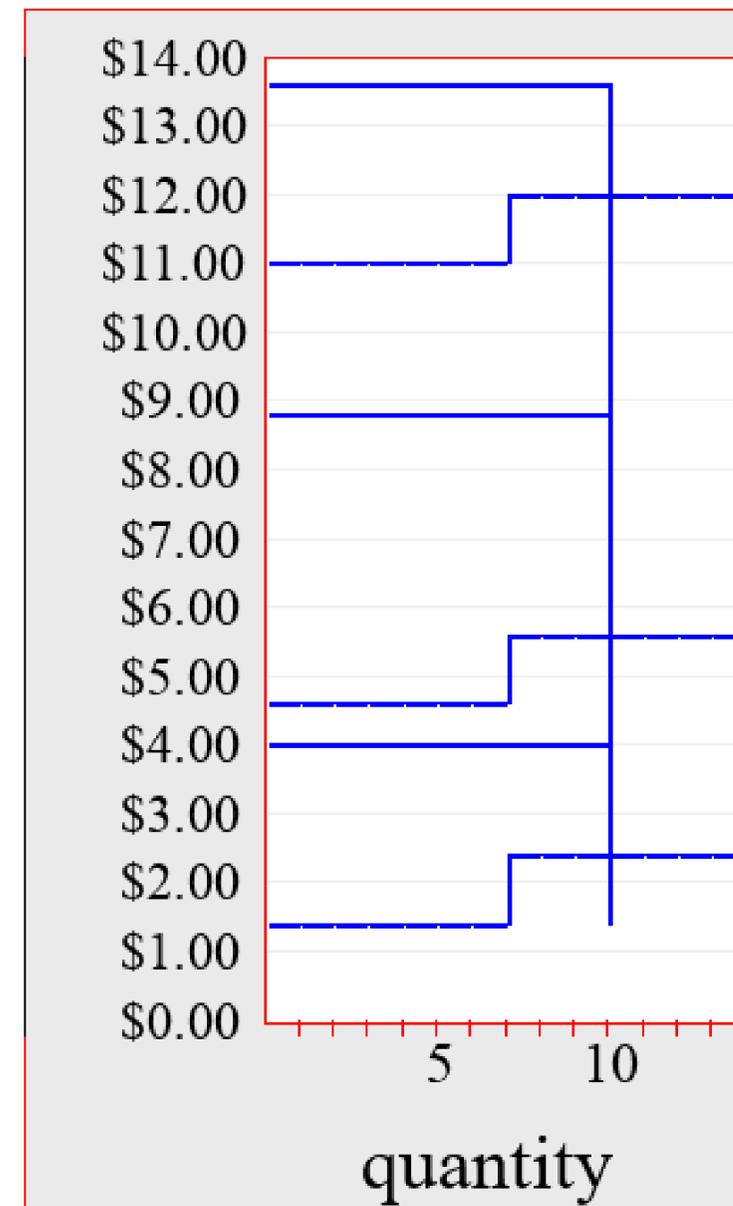
Lab report 2: Working with data

Questions 5-6

R#	Quantity n per round	Average price in $	Efficiency in %	Average grade
1	7	7.17	67.7	2.00
2	7	6.61	62.1	1.71
3	9	8.18	82.6	2.11
4	9	8.03	82.6	2.11
5	10	7.19	97.4	2.00

quantity   Transactions Prices and Quality Grades (1-3)

Treatment 1 (no ratings)
full grade information
prices revealed to sellers

Treatment 2 (no ratings)
asymmetric grade information
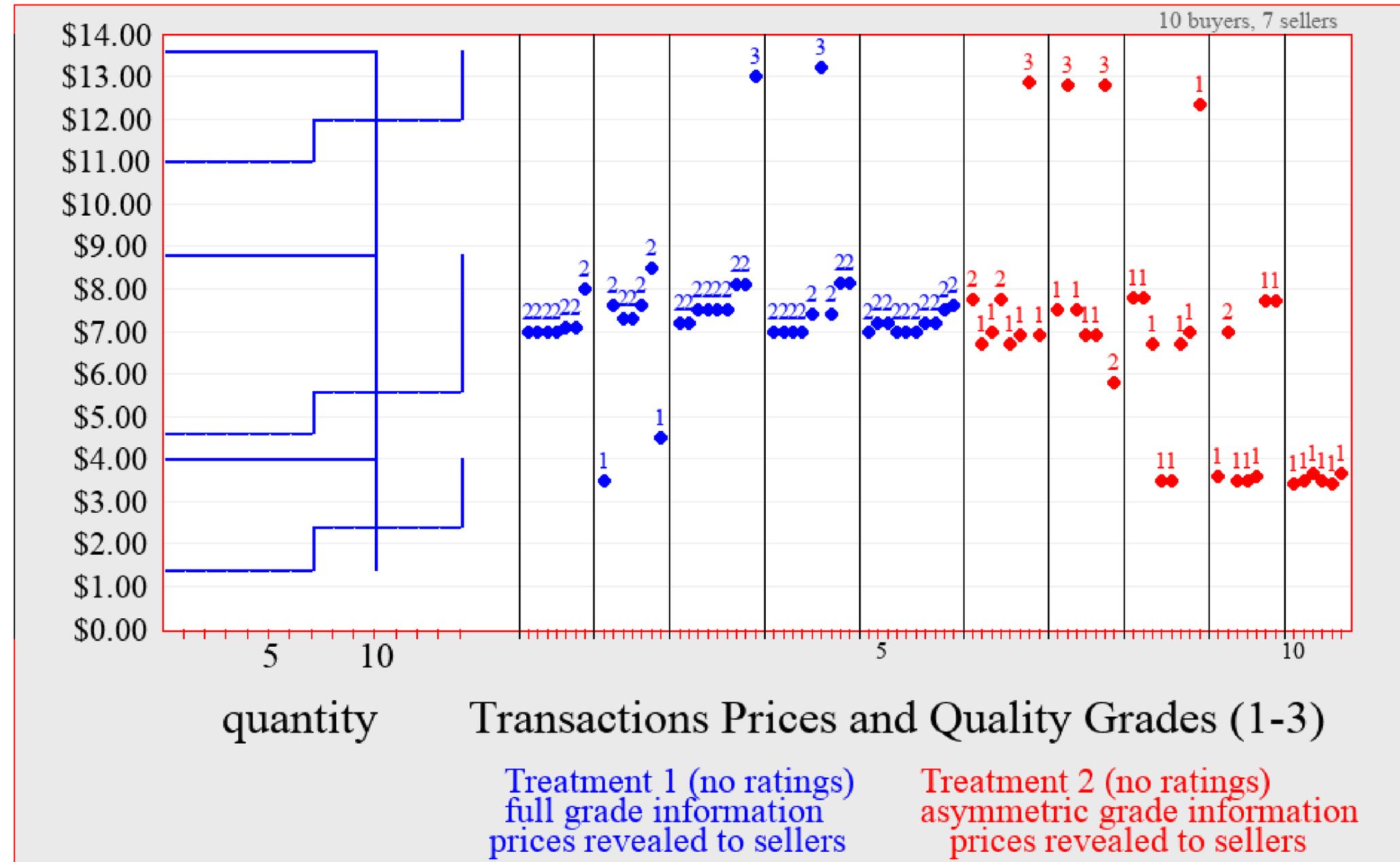prices revealed to sellers
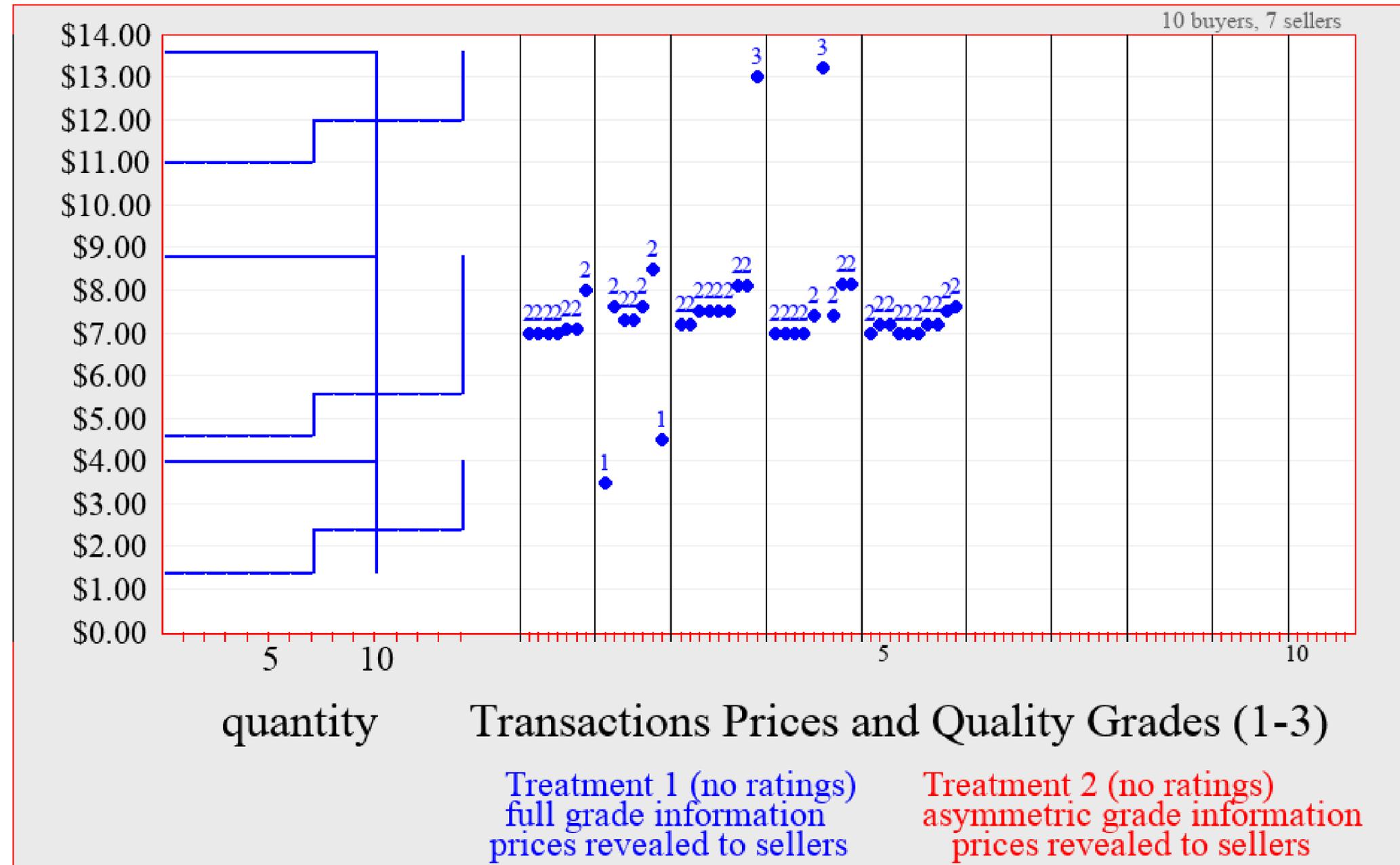
Asymmetric information treatment

➢ Endogenous product quality + asymmetric information on quality

▪ Sellers only know their own grade, not the one of other sellers.

▪ Buyers do not observe sellers' quality grades.

▪ Buyers see the price of each seller.

▪ Sellers take advantage of buyers' ignorance and provide low-quality goods at high prices.

▪ Buyers expecting this behavior only buy low priced goods, thus high-quality products are not offered.

Lab report 2: Working with data

Question 7

R#	Quantity n per round	Average price in $	Efficiency in %	Average grade
1	7	7.17	67.7	2.00
2	7	6.61	62.1	1.71
3	9	8.18	82.6	2.11
4	9	8.03	82.6	2.11
5	10	7.19	97.4	2.00
6	8	7.82	53.8	1.50
7	7	8.60	43.1	1.71
8	8	6.92	45.6	1.00
9	7	5.23	43.1	1.14
10	6	3.52	32.3	1.00

10 buyers, 7 sellers

quantity   Transactions Prices and Quality Grades (1-3)

Treatment 1 (no ratings) full grade information prices revealed to sellers

Treatment 2 (no ratings) asymmetric grade information prices revealed to sellers

Moral hazard

- Moral hazard refers to a situation in which an agent has incentives to increase her exposure to a risk for which she does not have to bear the full costs if things go wrong.

➤ Sellers face moral hazard

Moral hazard

Examples

- People with fire insurance may be less interested in preventing fires than those without.

- People with insurance against auto theft are likely to take fewer precautions against car theft than people who do not have insurance.

- People with unemployment insurance may search less intensely for jobs.

- Workers whose performance is not monitored may slack.
  → classic *principal-agent* example

- Construction contractors whose work is not closely inspected may do shoddy work, which does not become apparent until after they are paid.

Adverse selection

Akerlof's model

➢ Exogenous product quality + asymmetric information on quality

• There are high-quality and low-quality sellers.

• However, high-quality sellers drop out because they do not expect high prices from buyers who cannot infer product quality.

Adverse selection

- Adverse selection occurs when your trading partners possess less favorable characteristics than the population at large.

➢ Buyers and sellers face adverse selection

- Occurs in a market when buyers or sellers would, on average, be better off trading with someone selected at random from the population than with those who volunteer to trade (self-select into the market → adverse selection effects).

Adverse selection

Insurance markets

➢ The problem of adverse selection also applies to insurance markets. Why?

• The customers who want insurance the most are the people who face the highest risks, but these are the people that insurance companies would least like to have as customers.

Adverse selection

Insurance markets

- Those who want to buy collision insurance for cars are those who drive a lot and are most likely to have accidents…

- and may drive even more recklessly afterwards $\rightarrow$ *moral hazard*

- Those who are most eager to buy health insurance are those who have reasons to think they are going to have an expensive illness.

$\rightarrow$ inside information is *asymmetric information*

Adverse selection

Insurance markets

- Those most likely to buy life insurance are those who may have reasons to believe they may die sooner.

- Those most eager to buy annuities are those who have reasons to believe that they will live for a long time. (*annuity* is a promise to pay somebody a fixed amount every year until they die)

NEXT CLASS

Experiment for course credit