

14.27 Problem Set 3

Due 10/29

Question 1: Price Discrimination and Surfboards.

Suppose you are the manufacturer of surfboards which are sold in two separate markets: California and Hawaii. You have factories in both locations, and each can produce an unlimited number of surfboards at a constant marginal cost of \$10 per surfboard. Over the last fourteen weeks you've conducted an experiment by varying your prices each week. Your sales at various prices were:

Price	Q in California	Q in Hawaii
10	130	31
11	106	27
12	105	31
14	100	24
15	60	24
16	70	25
17	65	18
18	60	23
20	48	21
22	28	14
24	12	18
25	2	14
26	1	10
30	0	9

Figure 1: Experimental Prices and Quantities

- (a) Use an OLS regression to estimate linear demand curves for each market.

	California	Hawaii
Demand: $Q = \gamma + \delta P$		
γ	183.65	40.92
δ	-6.86	-1.09

(b) Given these estimated demand curves, what prices would you set in each market assuming that there is no Hawaii – California resale market?

The monopolist solves: $\max_p (\gamma + \delta P)(P - c) \Rightarrow \gamma + 2\delta P - c\delta = 0 \Rightarrow P = \frac{-\gamma + c\delta}{2\delta}$

Plugging in, $P^C = 18.4$ and $P^H = 23.7$.

(c) How would you change these prices if antitrust laws required that you set a common price across both markets? Which consumers benefit from this? Which lose? Why?

If forced to set a common price, the monopolist maximizes with respect to aggregate demand. Note that different prices make $Q = 0$ in the two states:

	P that makes $Q = 0$
California	26.76
Hawaii	37.48

This implies that aggregate demand is kinked:

- If $P < 26.76$: $Q^{AGG} = Q^H + Q^C = 224.6 - 7.95P$
- If $P > 25.76$: $Q^{AGG} = Q^H = 40.92 - 1.09P$

This implies that to find the common price optimum, we have to check two cases:

1. Only Hawaii is served. ($P \geq 26.76$).
2. Both states are served. ($P < 26.76$).

If both states are served, $P^* = \frac{-\gamma^{AGG} + c\delta^{AGG}}{2\delta^{AGG}} = 19.12$ and $\pi = 661.15$. If only Hawaii is served, $P^* = 23.74$ and $\pi = 206.1$. Therefore, it is optimal to charge 19.12. Note that this price is higher than the price charged in California if the firm is allowed to price discriminate, and lower than the price charged in Hawaii if the firm is allowed to price discriminate. Therefore, C consumers lose and H consumers win. The elasticity at the optimal common price is 2.5 for California and 1.04 for Hawaii, so more elastic consumers prefer price discrimination, while more inelastic consumers prefer common pricing. This is the case because when the firm is allowed to price discriminate between them, it will set a higher price for inelastic consumers and a lower price for elastic consumers. Common pricing forces the firm to set a price that counterbalances these two effects.

(d) Calculate profits and consumer surplus under both the uniform pricing and the discriminatory pricing regimes. How are profits and consumer surplus affected by the shift to uniform pricing? How are total quantity supplied and total social welfare affected? Given these calculations, how do you feel about the antitrust authority's policy?

	Profit	CS	Welfare
Common Pricing			
California	478.37	200.60	678.97
Hawaii	182.77	184.06	366.83
Total	661.15	384.65	1045.80
Price Discrimination			
California	482.08	241.04	723.13
Hawaii	206.10	103.05	309.15
Total	688.19	344.09	1032.28

Figure 2: Profit, Consumer Surplus and Welfare Comparison

Note that profits are higher with price discrimination, and consumer surplus is lower. Overall, welfare decreases with discrimination.

Also, note one must take into account the kink in the aggregate demand curve when calculating CS. The simplest way to do this is to calculate it separately for both states. Many of you got this wrong.

(e) Suppose an online retailer opens up that lists surfboards produced in either market and can ship surfboards between California and Hawaii for \$4 per board. Would this disturb your discriminatory pricing strategy, and if so what would your response be? (Hint: Calculate the optimal discriminatory prices subject to the constraint that the two prices cannot differ by more than \$4.00).

The discriminatory pricing strategy is disrupted, as without constraint the price gap between both states is greater than 4. As a result, the monopolist must re-optimize, taking this constraint into account. The monopolist solves: $\max_{P^C, P^H} (P^C - c) Q^C + (P^H - c) Q^H$ subject to $|P^C - P^H| \leq 4$. We know that the unconstrained optimum has $P^H > P^C$, so in the constrained optimum we will also have $P^H > P^C$. We also know that in the unconstrained optimum the difference between prices is greater than 4. As a result, in the constrained optimum this restriction must bind. As a result, we can re-write the problem as: $\max_{P^C, P^H} (P^C - c) Q^C + (P^H - c) Q^H$ subject to $P^C = P^H - 4$, or $\max_{P^H} (P^H - 4 - c) (\gamma^C + \delta^C (P^H - 4)) + (P^H - c) (\gamma^H + \delta^H P^H)$.

$$\text{The FOC is: } \gamma^C + \delta^C (P^H - 4) + \delta^C (P^H - 4 - c) + \gamma^H + \delta^H P^H + \delta^H (P^H - c) = 0$$

$$P^H = \frac{-(\gamma^C + \gamma^H) + c(\delta^C + \delta^H) + 8\delta^C}{2(\delta^C + \delta^H)} = 22.57$$

$$P^C = \frac{-\gamma^H - \gamma^C + (\delta^H + \delta^C)c + 8\delta^C}{2(\delta^C + \delta^H)} - 4 = 18.57$$

Question 2: Rental Car Search.

(a) Get on the internet and find the best price you can for renting a compact size car to be picked up at the Los Angeles, California (Airport code: LAX) airport on November 17 and returned there on November 24. Please limit the number of minutes spent searching to the day of the month on which you were born, e.g. 1 minute if you were born on November 1 or 14 minutes if you were born on September 14. If you were born very early in the month and can't get any price in your allotted time, report the first price you find and the time it took you to find it.

(b) How much does it add to the price in (a) if you want a car seat? (You can go over the time limit to answer this part).

(c) Pick another country at random and pretend that's where you're from. Again, please limit the number of minutes spent searching to the day of the month on which you were born. What happens to your rental car price?

Think about the price dispersion that you have found, offer an interpretation for it through the lens of the models of price search and price discrimination that we have studied. (Keep in mind that there could be other explanations, such as cost-based ones, for what you observed.)

Question 3: Obfuscation.

Go to the website pricewatch.com.

(a) Pick five products from different categories. Look to see whether there are a substantial number of competitive sellers for each product. Record your findings. Speculate on why Pricewatch may be succeeding in attracting sellers in some categories but not in others.

(b) Pick a product for which there are a substantial number of sellers, e.g., 64 GB USB Flash Drives. Click through to a number of the sellers and note whether listed prices are easy to find, whether the product descriptions make them less attractive than you would have expected, or whether there seem to be other obfuscation techniques at work. Do you think that Pricewatch has been successful at making price search easy in your particular product category, or that firms' obfuscation strategies are successful? Comment.

Question 4: Research Proposal.

Please provide a rough proposal for your research project. It should be approximately $\frac{1}{2}$ to 1 page in length. While this proposal does not commit you to a particular topic, the more detailed you can be, the better! (Three potential styles of paper were suggested on the first day of class: 1) Describe an online market or industry, along with a discussion of its offline antecedents, what is new or different in the online market, and what the core economic issues are. 2) Ask a question of economic interest about an online market or industry, gather data, analyze the data, and answer the question. (Some knowledge of econometrics will be useful here.) 3) Offer a preponderance of useful facts about an online market or industry. (Formal econometric analysis might not be necessary here, but some data gathering will be.) Your paper can fit into one of these three categories, but other styles of paper could also be acceptable.)

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