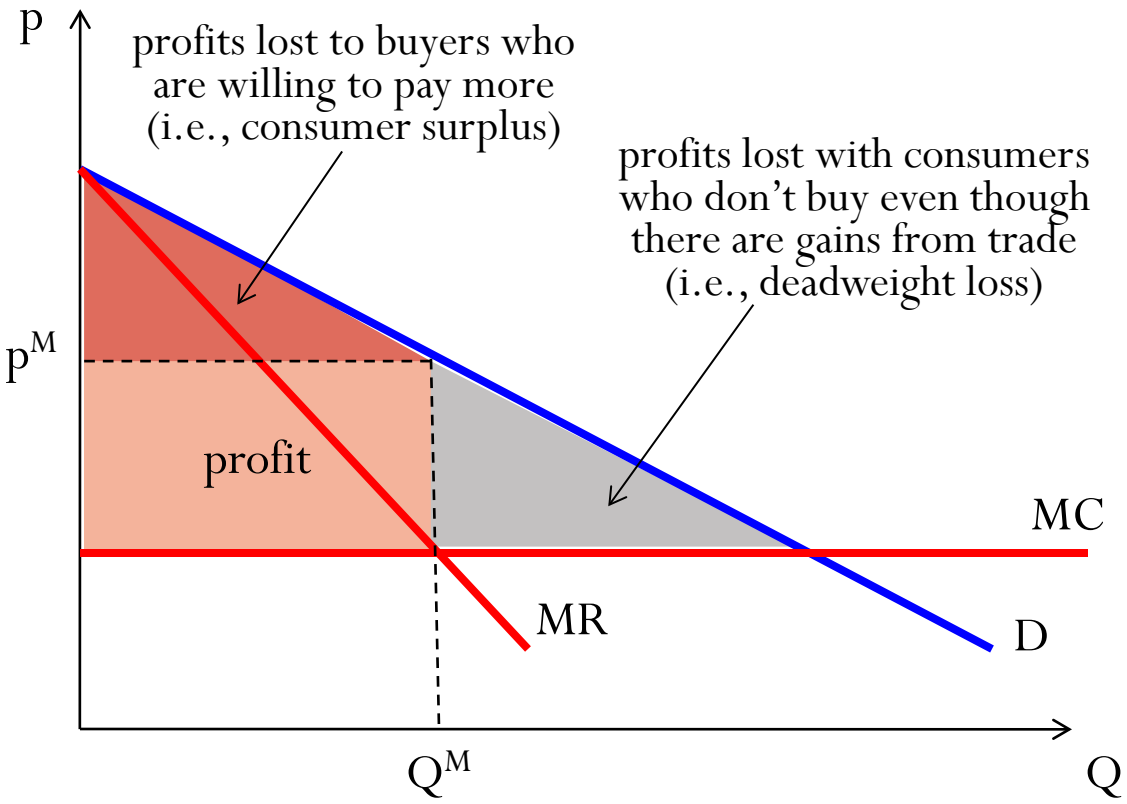
- 1. Price discrimination
- 2. Experiment #2: ZipRecruiter.com
- 3. Versioning
- 4. Bundling
- 5. Other Pricing Strategies

Introduction

- Frequently, firms charge different prices to different market segments. Why? What if the firm cannot directly identify the different segments?

- Market segmentation, elasticity rule, self-selection

Motivation for Price Discrimination



Simple pricing leaves money on the table!

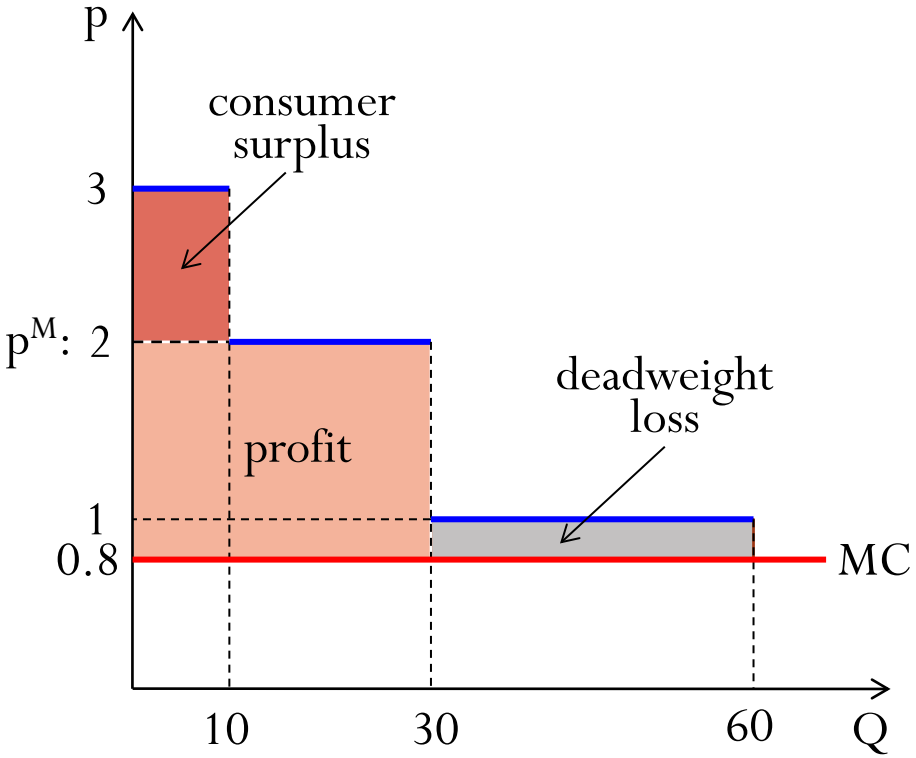
Example: Laptop Pricing

- Unit production cost: $800
- Three types of potential buyers:

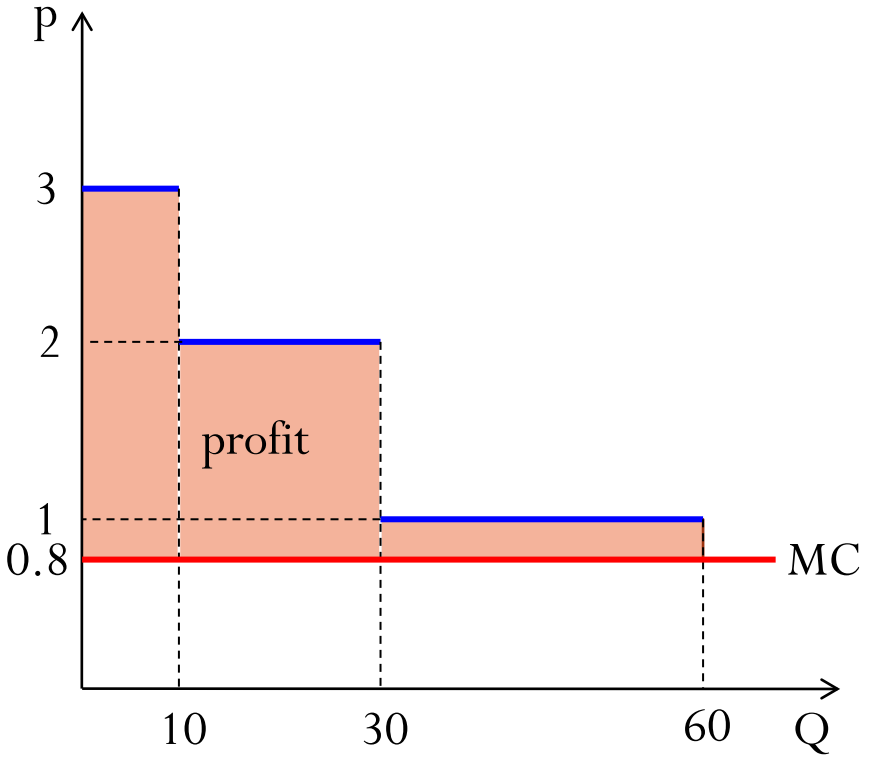
Type	Willingness to Pay ($)	No. (k)
1	3,000	10
2	2,000	20
3	1,000	30

- Optimal uniform price?
- What about if the firm can distinguish each type of buyers?

Example: Laptop Pricing ...



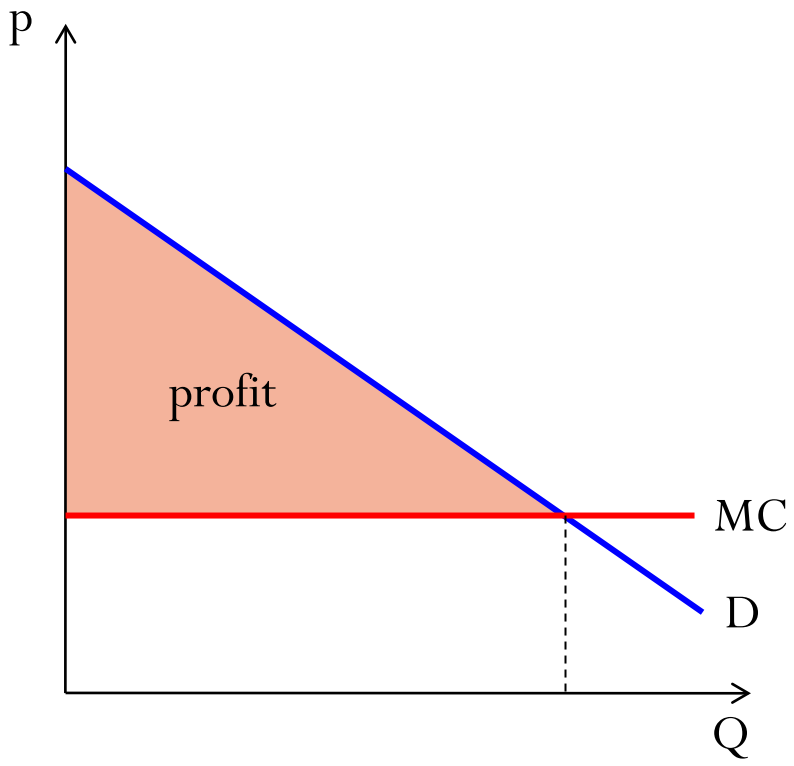
Optimal uniform pricing:
price=2 ⇒ profit=36k



Price discrimination:
charge each group at their willingness to pay ⇒ profit=52k

Ideal Situation: Perfect PD

- **Perfect price discrimination**: each customer is charged a different price---exactly at her/his willingness to pay
  - Ideal situation: (i) The firm extracts all possible surplus. (ii) Market efficiency *improved* (if we don't care about who get the pie): no deadweight loss now!
- But rarely happens in the real market (examples?). Why?
- In the following, we will discuss price discrimination strategies that are approximations to perfect PD …



PD with Direct Market Segmentation

- It's hard to know each individual consumer's willingness to pay
- It might be more practical to divide consumers into a few groups according to some *directly identifiable* characteristics
  - Student/senior/child
  - PD by geography (e.g., plumber)
  - PD by type of product to perform service (automobiles, watches)
  - Time of day (matinee, lunch/dinner)
- Then apply *elasticity rule* $(p-MC)/p=-1/\varepsilon$ to different segments of consumers: higher prices for those groups with less elastic demand
- Practical limits (arbitrage)
- Legal limits: Injury to competition (U.S.)

Su	Mo	Tu	We	Th	Fr	Sa
					Jan 13	Jan 14
					From $5,294	From $5,294
Jan 15	Jan 16	Jan 17	Jan 18	Jan 19	Jan 20	Jan 21
From $5,294	From $5,294	From $5,294	From $5,294	From $5,294	From $4,765	From $4,765
Jan 22	Jan 23	Jan 24	Jan 25	Jan 26	Jan 27	Jan 28
From $5,294	From $4,765	From $4,765	From $4,765	From $4,765	From **$3,505**	From **$3,505**
Jan 29	Jan 30	Jan 31	Feb 1	Feb 2	Feb 3	Feb 4
From $5,294	From **$3,505**	From **$3,505**	From **$3,505**	From **$3,505**	From **$3,505**	From **$3,505**
Feb 5	Feb 6	Feb 7	Feb 8	Feb 9	Feb 10	Feb 11
From $5,294	From **$3,505**	From **$3,505**	From **$3,505**	From **$3,505**	From **$3,505**	From **$3,505**

Su	Mo	Tu	We	Th	Fr	Sa
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Jan 22	Jan 23	Jan 24	Jan 25	Jan 26	Jan 27	Jan 28
From $5,294	From $5,294	From $5,294	From $5,294	From $4,765	From **$3,505**	From **$3,505**
Jan 29	Jan 30	Jan 31	Feb 1	Feb 2	Feb 3	Feb 4
From $5,294	From $5,294	From $5,294	From $5,294	From **$3,505**	From **$3,505**	From **$3,505**
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From $5,294	From $5,294	From $5,294	From $5,294	From **$3,505**	From **$3,505**	From **$3,505**

New York-London Round Trip (6-day stay vs 3-day stay)

Car Markups (in %) in European Market

Model	Blgm	France	Ger'y	Italy	UK
Fiat Uno	7.6	8.7	9.8	21.7	8.7
Nissan Micra	8.1	23.1	8.9	36.1	12.5
Ford Escort	8.5	9.5	8.9	8.9	11.5
Peugeot 405	9.9	13.4	10.2	9.9	11.6
Mercedes 190	14.3	14.4	17.2	15.6	12.3

Data from early 1990s

What's going on here?

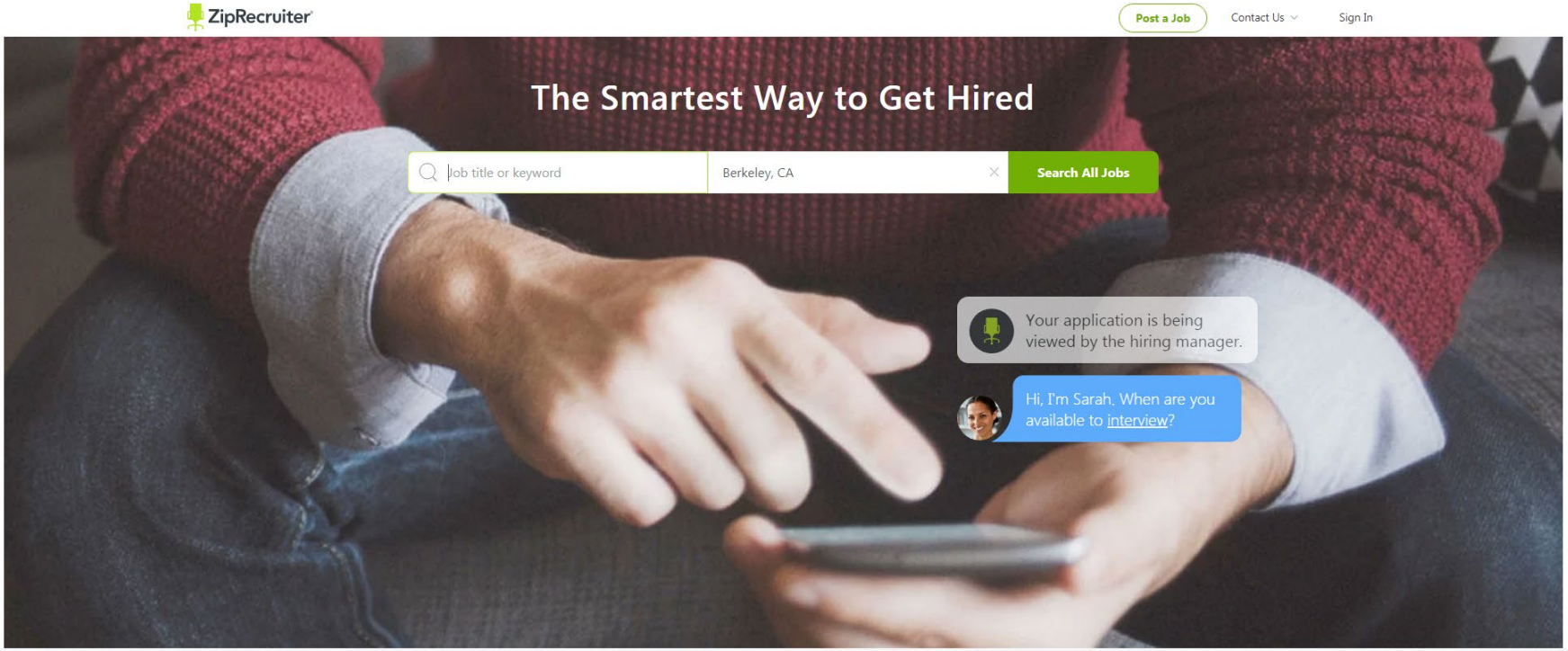
Practice: Pizza Pricing

- Undergrads come at lunch time, elasticity = -4. MBAs come at dinner time, elasticity = -2.
- Unit cost: c=6
- Optimal prices?
- Suppose both undergrads and MBAs come throughout the day. What challenges do you face to maintain the same revenue as before?

Ice-Cream Example

- Recall our ice-cream example:
  - Demand: $Q=20-2p$, marginal cost: $MC=3$, and fix cost: 15
  - Optimal uniform price: 6.5, and optimal profit: 9.5
- Suppose Jack can charge different prices to men and women.
- Suppose the demand from men is $q_m=8-0.5p_m$, and the demand from women is $q_w=12-1.5p_w$.
- What are the optimal prices for each group of consumers? What's the new profit?

Case Study: ZipRecruiter.com



AS SEEN ON

The New York Times · WSJ · Forbes · TIME · TC · CBS

Over 8 Million Jobs

There's no need to look anywhere else. With over 8

ZipRecruiter.com

- Online platform that matches job seekers with employers
- Job seekers post resumes. Service is free for job seekers.
- Firms pay a monthly subscription fee to access a stream of resumes of qualified candidates. Can cancel at any time.
- Firms post information about its characteristics before reaching paywall.
  - Information include type of business, job category, medical benefits etc.
  - A total of 133 variables.

Experiment 2: Price Discrimination

- Experiment 2
  - Customize prices to firms upon reaching paywall (targeted prices)
    - October 27-November 17, 2015.
    - 5,315 unique firms visited paywall during the period.
    - Randomly assigned firms to one of three treatments:
      - Control Pricing (25%) - $99
      - Uniform Pricing (25%) - $249
      - Targeted pricing (50%) - $119 to $499, depending on firm characteristics

Experiment 2: Price Discrimination

- How to customize prices?
  - Use data collected from Experiment 1 to estimate probability of purchase/demand.
    - Estimate demand function conditional on recorded characteristics (133 variables)
    - Logit specification:

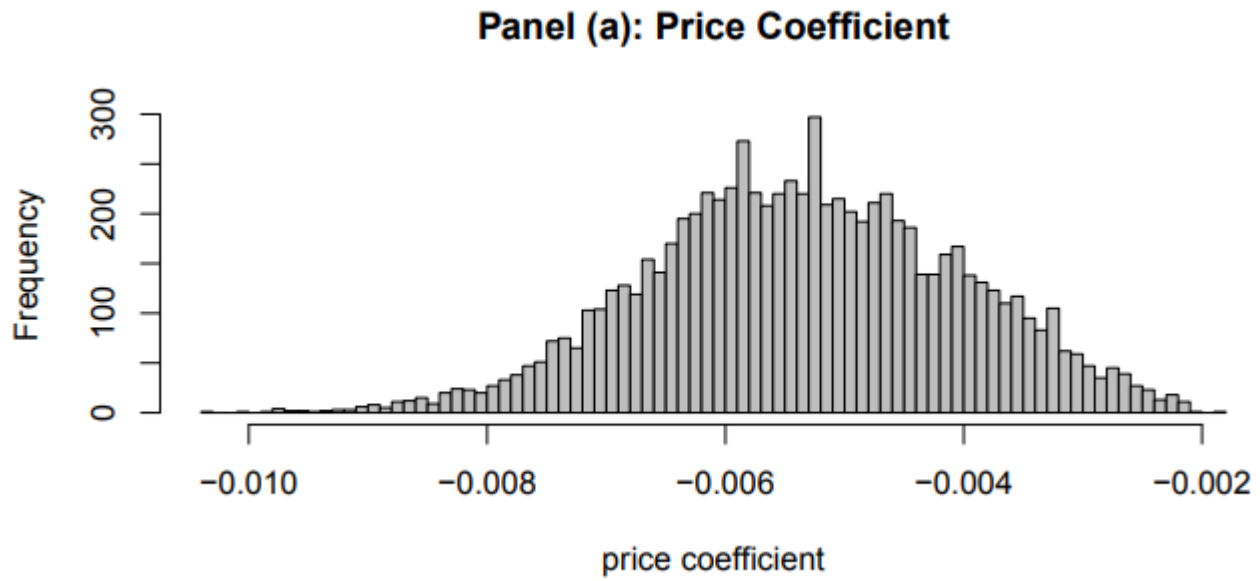
$$\Pr(purchase|p,x) = \frac{\exp(f(x) + g(x)p)}{1 + \exp(f(x) + g(x)p)},$$

    - where p is price, x is a 133 x 1 vector. $f(x)$ and $g(x)$ are functions to be estimated.
      - Think about $f(x)$ as "intercept" and $g(x)$ as "slope":
        - C.f. $\Pr(purchase|p,x) = f(x) + g(x)p$
      - Both "intercept" and "slope" depends on firm characteristics.
    - $f(x)$ and $g(x)$ are estimated using Bayes Lasso.
      - C.f. "Machine Learning"
      - Other alternatives include MLE… can you do it if you had data?

Experiment 2: Price Discrimination

- Estimates

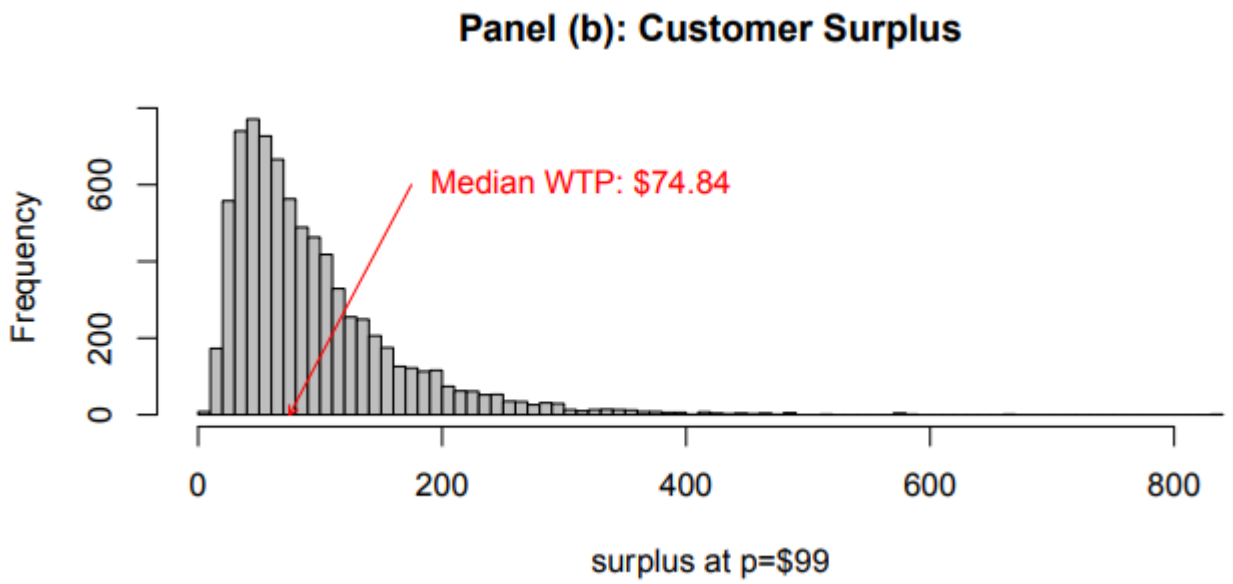
  Histogram of estimated $g(x)$



Experiment 2: Price Discrimination

- Estimates

  Histogram of estimated $f(x)$



Experiment 2: Price Discrimination

- How to customize prices?
  - Estimate probability of purchase:

$$\Pr(purchase|p,x) = \frac{\exp(f(x) + g(x)p)}{1 + \exp(f(x) + g(x)p)},$$

  - Based on estimated probability of purchase, find optimal customized price for a firm with a given characteristic x.

  - Question: Derive the optimal price as a function of x, taking as given that you know $f(x)$ and $g(x)$. Assume marginal cost is zero.
    - Expression for optimal price, $p^*(x)$, is messy, so just tell me how you would solve for it.

Experiment 2: Price Discrimination

- Implementation
  - Obtain firm characteristics x before reaching paywall
  - Display customized optimal price, $p^*(x)$.
  - $p^*(x)$ ranges from \$119 to \$499.

Experiment 2: Price Discrimination

- Histogram of $p^*(x)$

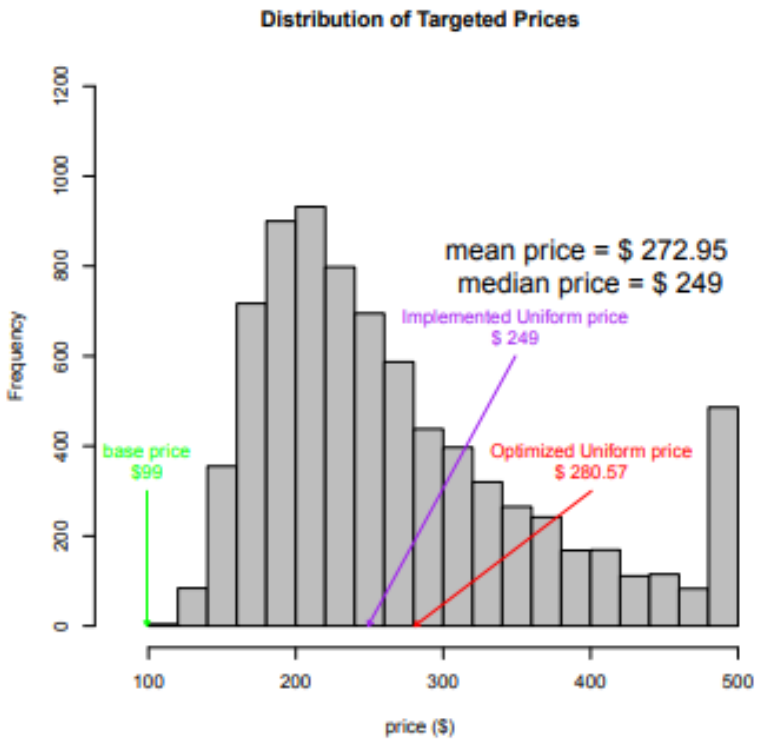
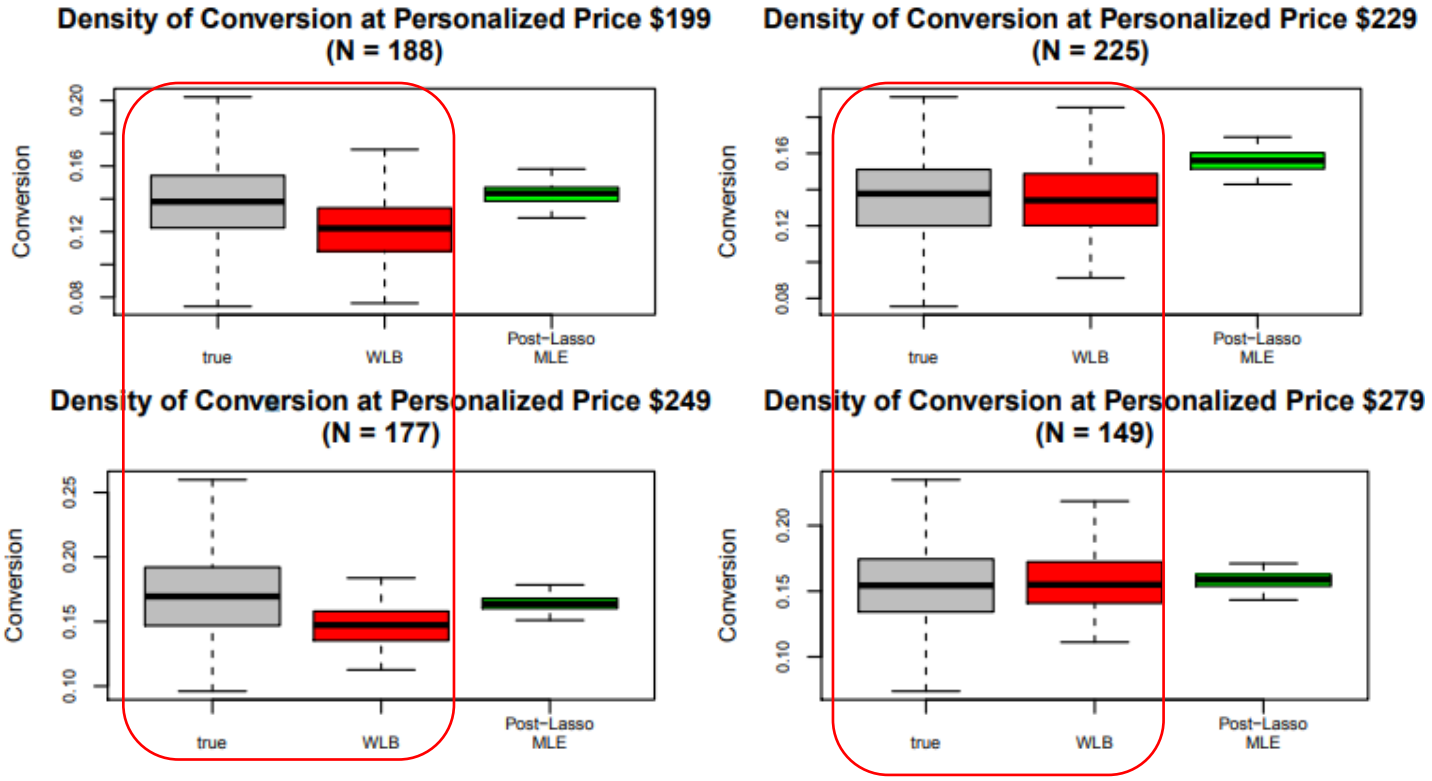


Figure 5: Optimized Prices (N=7,867).

Experiment 2: Price Discrimination

- Demand estimate gives us a prediction of conversion at optimal targeted prices. How good is the prediction relative to actual?
- Comparison of true and predicted conversion at 4 price points (not showing all)



Experiment 2: Price Discrimination

- Results on the "bottom line"

Pricing Structure	# subjects	Conversion Rate		Profit per Customer ($)	
		Mean	95% Conf. Interval	Mean	95% Conf. Interval
Control	1360	0.23	(0.21,0.25)	22.55	(20.75,24.39)
Implemented Uniform	1430	0.15	(0.14,0.17)	37.73	(33.78,41.79)
Targeted	2485	0.15	(0.14,0.16)	41.67	(38.34,45.10)

- $99 uniform pricing to $249 uniform pricing leads to about 68% increase in profits per customer who reach paywall.
- Targeted pricing increases profits by 84% relative to baseline.

Experiment 2: Price Discrimination

- Takeaways:
  - Pricing is not hard to implement (relative to improving product quality, for example)
  - Simple economic model and econometrics has large payoffs (in this case +84% profits).
  - At least in this case study, MLE performs ok compared to machine learning techniques (i.e., bayes lasso).

Versioning

Type	Will. to pay ($)		No. (k)
	Coach class	First class	
Low income	300	350	20
High income	400	700	10

- Unit cost: $100 for coach and $200 for first class
- Optimal price if coach class only?
  - p=300: profit 200×30=6,000; p=400: profit 300×10=3,000
- Optimal price if first class only?
  - p=350: profit 150×30=4,500; p=700: profit 500×10=5,000
- If only supply one version of the product, the monopoly should supply coach class at p=300

Versioning ...

Type	Will. to pay ($)		No. (k)
	Coach class	First class	
Low income	300	350	20
High income	400	700	10

- Unit cost: $100 for coach and $200 for first class
- Optimal pricing scheme if both products are supplied?
  - When Consumer valuations are not observable.
  - Ideal pricing scheme: $300 for coach class and $700 for first class $\Rightarrow$ profit $200\times20+500\times10=9{,}000$
  - *But infeasible*: high-income consumers can get surplus $100 by buying coach class, so cannot charge them more than $600 for first class
  - Optimal pricing scheme: $300 for coach class and $600 for first class $\Rightarrow$ profit $200\times20+400\times10=8{,}000(>6{,}000)$

Versioning …

Type	Will. to pay ($)		No. (k)
	Coach class	First class	
Low income	280	350	20
High income	280	700	10

- "Damage" coach class. The *same* unit cost: $100 for coach and $200 for first class
- Optimal pricing scheme?
  - $280 for coach class and $700 for first class: profit is 180×20+500×10=8,600 (higher than before)
  - Lowering the quality of coach class can induce high-income consumers to pay *more* for first class as they are more quality sensitive

Comments

- Key constraint: *you can't make the inexpensive version too attractive to those willing to pay more*
- In practice, this is often based on years of experience of what the market will bear

"It is not because of the few thousand francs which would have to be spent to put a roof over the third-class carriage or to upholster the third-class seats that some company or other has open carriages with wooden benches … What the company is trying to do is prevent the passengers who can pay the second class fare from travelling third class; it hits the poor, not because it wants to hurt them, but to frighten the rich."

--- Emile Dupuit (19th century French economist)

Unlocking your CPU

—

Intel wants to charge $50 to unlock stuff your CPU can already do

Sean Hollister
09.18.10

18
Shares

Region-Free DVD

CodesForUniversalRemotes

FIND THE CODE FOR YOUR REMOTE CONTROL OR TV - ALL BRANDS OF TV, AUDIO, & HOME THEATER

DVD Player Region Code Removal Hacks

How to make your DVD or Blu-Ray player multi-region or region free. Watch any region code DVD or Blu-ray on your player. There are different ways to switch or remove regional codes on DVD players. DVD or Blu-Ray region coding can be removed from your player using a simple remote control code and other types of removal hacks to unlock the player. The methods below are proven to work with all players to play and watch any region code DVD or Blu-Ray. *NOTE: You can use **VLC media player** to watch DVDs on your computer/laptop region free.*

SEARCH OUR SITE: TYPE & PRESS ENTER

Google Custom Search

REMOTE CONTROL CODES BY TV BRAND

Remote Control Codes For Hitachi TVs

Bundling

- **Pure bundling**: several products are sold in a package, and no separate purchase is available
  - CDs; newspapers and magazines; TV packages; education programs
- **Mixed bundling**: alongside each separately priced product, a package of more than one product is sold at a discount relative to the components
  - Season tickets; software suites; TV+Internet+Phone; value meals

$139.99

Outlook 2010

$139.99

Word 2010

$139.99

PowerPoint 2010

$139.99

Publisher 2010

$79.99

OneNote 2010

$119.99

Word Home and Student 2010

$119.99

PowerPoint Home and Student...

From $119.99

Office Home and Student 2010

From $199.99

Office Home and Business 2010

From $349.99

Office Professional 2010

An example of mixed bundling

Example: Pure Bundling

Type	Will. to pay for Word	Will. to pay for Spreadsheet	No. (k)
A	120	100	10
B	100	120	10

- Separate pricing:
  - 100 for each product $\Rightarrow$ profit: $100\times20+100\times20=4{,}000$
- (Pure) bundling:
  - 220 for the package $\Rightarrow$ profit: $220\times20=4{,}400$
- Bundling is more profitable than separate pricing when there is *negative correlation of demand* (i.e., when the customers who like one good the best are those who dislike the other good the most)

Example: Mixed Bundling

Type	Will. to pay for Word	Will. to pay for Spreadsheet	No. (k)
A	120	100	5
B	100	120	5
C	0	120	5
D	120	0	5

- Separate pricing:
  - 100 for each $\Rightarrow$ profit: $100\times15+100\times15=3{,}000$
- Pure bundling:
  - 120 for the package $\Rightarrow$ profit: $120\times20=2{,}400$
- Mixed bundling:
  - 120 for each, and 220 for the package $\Rightarrow$ $120\times10+220\times10=3{,}400$

Other Pricing Schemes

- Two-part tariffs
  - Lump-sum fee plus per-unit use price (e.g., health clubs; amusement parks; credit cards)
  - Idea: firms can extract more consumer surplus through charging fixed fees in addition to unit prices
  - Outcome: consumers with higher usage pay a lower average price
- Coupons
  - Idea: buyers with low valuations (e.g., the unemployed) may also value their time less, and will put more effort in clipping coupons
  - Outcome: rich and busy people pay more than poor people
  - Similar idea applies to some sales

Other Pricing Schemes …

- Intertemporal price discrimination
  - Price declines over time (e.g., movies and books)
  - Idea: high valuation users are often less patient
  - Outcome: less patient (or high-valuation) consumers pay more
- Complementary product pricing
  - Idea: reducing one product's price increases the demand for *both* products (e.g., razor blades and razors; printers and inks)
  - Outcome: lower prices than when each product is sold by separate monopolies

Summary

- When firms have market power, price discrimination is an important way to increase revenue
- Key issues for price discrimination:
  - Identifying market segments
  - Avoiding "arbitrage"
- If direct market segmentation is feasible, apply elasticity rule to each segment separately
- Otherwise, you may want/need to provide self-selection schemes (i.e., a menu of price-quantity/quality combinations) to induce consumers to distinguish themselves