Price Discrimination

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Introduction

So far just one price for product

- Distortion: higher quantity lowers infra-marginal price
  - If you can charge different units/people differently, avoids

- This is the idea of price discrimination we’ll study today

  1. Perfect or first-degree price discrimination
     - Efficiency and practical limitations
  
  2. Second-degree or quantity-based price discrimination
     - Also, related, quality-based price discrimination
  
  3. When second-degree discrimination is unattractive
  
  4. More exotic forms of discrimination
  
  5. Third degree or identity-based price discrimination
  
  6. Policy applications and implications
     - What are welfare effects of discrimination?
     - Price discrimination in auction design
First-degree price discrimination is ideal?

1. Charge every person personalized price
2. Different price for each unit sold
3. Match everything exactly to willingness-to-pay
   - Capture full surplus consumers gain (graph)

Rarely observed in real world (theoretical benchmark), but

1. Bargaining institution with very competent bargainer
2. Personalized pricing systems on the internet
3. CVS coupon systems

Best possible thing for monopolist, gets everything

- Therefore companies are always looking for better ways
- But terrible for consumers, gain no surplus
- But what about total social value?
  - Very attractive in many dimensions
Efficiency of first-degree price discrimination

First-degree price discrimination is highly efficient

- In fact, as efficient as perfect competition
- Every consumer willing to pay above cost served
  1. Can’t make anyone pay more than worth to them
  2. So charge them exactly that, for each unit
  3. Anytime willing-to-pay above cost, profit available
  4. Thus monopoly sells efficiently

Why does 1st degree discrimination do so well?

1. Selling more doesn’t require lowering price
2. Seller can capture full value created
3. Thus tries to maximize value created

However, seller captures all value

- Consumers gain no surplus
  ➞ Distributive issues important objection
Distributive objections and (partial) solutions

Thus perfect price discrimination often unpopular

- But more efficient...so should be possible to redistribute
- Economists advocate pairing with redistributive method
  1. Bidding for right to monopoly (franchise)
     - Government auction, captures all profits for other things
  2. Profit taxes
     - Government taxes away profits, distributes as pleases
  3. Labor unions
     - Unions extract profits as higher wages

- None of these solutions as perfect as it sounds
  - Redistributive authority, competitor needs to know profits
- Also may be benefits not to redistributing
  - Allows firm to capture full value created (Tuesday)
- Lessons apply to broader price discrimination
Whatever its merits, first-degree discrimination difficult

- This is why we rarely see it in practice
- Barriers to implement include?
  1. Administrative and “menu” costs
     - Requires quoting different price to consumers
     - Could they even process this? Predict? Plan?
  2. Fairness constraints
     - Many people think that price discrimination is unfair
     - Can alienate consumers
  3. Arbitrage and keeping track of consumers
     - If one consumer can easily resell, undermines system
  4. Information about willingness to pay
     - Most important, how to know what to charge each?
     - Fundamentally, distortion because monopolist *uniformed*
Examples of impracticality of perfect discrimination

To see why these are problems, consider some cases:

1. Prescription drugs, books and arbitrage?
   - Drug companies, publishers charge less in poor countries
   - Proved very problematic: reimportation (legal or illegal)
   - Also resentment leads to price controls in rich world
   - Think of how much worse if you tried to slice up countries!

2. Credit card surcharges and fairness?
   - Merchants charged for accepting credit cards
   - Would like to pass on to consumers, but resented
   - Legal restrictions too, but how much worse personalized!

3. Haggling and information?
   - Anyone in a bazaar knows it doesn’t always work
   - Because no one knows other’s value strategic postures
   - Even with face-to-face, first-degree very hard
Non-linear pricing and quantity discounts (surcharges)

Thus, in practice, price discrimination much less perfect

- One way firms commonly do this is *non-linear tariffs*
  - Different prices for different numbers of units
  - Often choice of different discrete bundles

- Examples of this (typically discount) abound?
  1. Bulk discounts in commercial goods
  2. Punch cards for loyal customers
  3. New York Times: free for 20 articles, charge after that
  4. Pricing of cloud file-sharing services
  5. Income taxes: rates vary depending on income level

- Goal: consumers *self-select* into right price
  - Lower price if they don’t mind storing, keeping track of card
  - Lower price to those who don’t value enough to use often

⇒ Not as effective, as must incentivize limited cheating
Graphical illustration of non-linear pricing

- Quantity discount
  - High value, low demand
  - Low value, high demand

- Quantity surcharge
  - High value, high demand
  - Low value, low demand
Qualities of service and multiple products

Can offer not just different quantities but also qualities

- This is very common strategy?
  1. Classes of service in airlines
  2. Qualities of rooms at a hotel
  3. Different levels of American Express card
  4. Tiers of cable and internet service

- Common observation: low-quality deliberately degraded
  - Not that the airline can’t offer better service
  - Deliberately makes Coach experience bad
  - This forces those who can to pay for business, first
  - Thus monopolist distorts quality as well as quantity
    - Particularly large for low-end customers
    - Less reason to make first-class worse
    - Cater to those who are elastic to price

⇒ Total welfare effect like that of 3rd degree below
Graphical illustration of quality-based discrimination
This only works if those with high quality unlikely to leave

⇒ Discrimination very attractive, extract from infra-marginal

1. Oi (1971) emphasizes opposite extreme
   - Marginal and infra-marginal are identical (in marginal utility)
   ⇒ No discrim.; charge up-front, then at (even below?) cost
   - Extract all value from up-front fee, so maximize value
   - Rides at Disneyland, Costco, Rhapsody, etc.
   - If also identical in overall value, same as perfect discrimination
   - “Efficient two-part tariff”

2. Less extreme version is “bundling”
   - Two pieces of software free to produce: Excel and Word
   - Some people like Excel better, some Word
   - Values for the package much more homogeneous
   - Then monopolist can capture much more value in package

⇒ Bundling like quantity/quality discount
Loyalty, sales and add-ons

Other forms of discrimination even less perfect, efficient

1. Loyalty and personalized discounts
   - CVS and others track your purchasing
   - Offer targeted discounts based on purchasing behavior
   - Helps get closer to perfect, but incentives to manipulate

2. Inter-temporal (sales)
   - Department, outlet stores’ periodic sales/discounts
   - Those whose demand is time-sensitive willing to pay a lot
   - Thus discriminate by offering less to those willing to wait
   - Airline ticket and hotel room pricing similar

3. Add-ons and obfuscation
   - Hotels, printers, banks and others cheap to get into
   - But soak you for lots of extras once you are on board
     => Discriminate against those who don’t read small print
One of my favorite examples is from *Les Miserables*:

Inn keeper Thenardier describes his pricing policies:

*Reasonable charges*

*Plus some little extras on the side!*

*Charge ’em for the lice, extra for the mice*

*Two percent for looking in the mirror twice*

*Here a little slice, there a little cut*

*Three percent for sleeping with the window shut*

*When it comes to fixing prices*

*There are a lot of tricks he knows*

*How it all increases, all them bits and pieces*

*Jesus! It’s amazing how it grows!*
When are prices discriminatory?

Some of these practices can be explained by costs

1. Peak-load pricing leads to variation across time
   - Little marginal cost of movie tickets when not full
   - Very valuable during rush times

2. May be cheaper to sell goods in bundles
   - Most of cost of software is the CD; cheaper to put together

3. Some populations cheaper to serve than others
   - Different prices for different insurance risks
   - Senior citizens less disruptive to other movie watchers

Then what makes something price discrimination?

1. Different prices reflect demand not cost conditions
   - This would never happen in competitive market
   - Efficiency variation even more likely in competitive

2. Lack of variation when costs vary just as discriminatory
Explicit price discrimination

Another, imperfect, approach is to group people

- Use some objective characteristic
- Charge different prices to people with these characteristics
  - Charge higher prices to those with more elastic demand
- Most commonly used in entertainment, transportation?

1. Senior, student and other discounts
2. Library surcharges for journals
3. Educator and public servant discounts
4. Prescription drug pricing in developing world
5. Home and office software licensing
6. Unemployment insurance, height tax and other tagging
  - More next week on this
7. Resident and tourist pricing in public services
8. Discounting menus in foreign languages (Chinese)
A mathematical example of explicit price discrimination

Demand $Q^S(p) = 1 - \frac{p}{2}$ “strong” market, $Q^W(p) = 1 - p$ “weak”

- Assume 0 marginal cost of production
- Discriminatory prices half of maximum: $p^S = 1, p^W = \frac{1}{2}$
- Pooled demand kinked?
  - For $p < 1, 2 - \frac{3p}{2}$, for $p > 1, 1 - \frac{p}{2}$
- Optimal from first segment is half way up: $\bar{p}^* = \frac{2}{3}$
- Compare profits from two points?
  - $1 \cdot \frac{2}{3} = \frac{2}{3}$ v. $1 \cdot \frac{1}{2} = \frac{1}{2} \implies \bar{p}^* = \frac{2}{3}$
- Is discrimination good or bad?
  - Output is same: 1 in either case
  - But SS without is $\frac{2}{3} \cdot 1 \cdot \frac{1}{2} + \frac{2}{3} = 1$, with is
    $1 \cdot \frac{1}{2} \cdot \frac{1}{2} + \frac{1}{2} \cdot \frac{1}{2} + \frac{1}{2} \cdot \frac{1}{2} = \frac{15}{16} < 1$; why?
    - High market values more, lose more of that than gain in low
Possible effects of third-degree discrimination

So we found output unaffected, welfare and CS down

- Special and weird: both linear so kink in total
- Properties hold generally for linear if both markets served
- More broadly:
  - If both markets served, output may go up or down
  - Welfare may go up or down
  - CS may go up or down
  - If weak unserved without discrimination, pure benefit

- Everything depends on pass-through rates:
  - The bigger PT is in weak v. strong, better is discrimination
  - Threshold smallest for output, then welfare, then CS
    - Mark-up higher in strong, profits rise so CS harder

⇒ In principle, discrimination can be good or bad
  - Only consistent is redistribution from strong to weak
Efficiency effect of 3rd degree discrimination

Thus efficiency of 3rd degree discrimination “ambiguous”

- But only means examples wrong way
- But this doesn’t mean we should expect both ways
- In most reasonable cases, 3rd degree like first
  - Raises welfare, transfers from consumers to producers
- Basic intuition: break into binary splits
  - Segment for everyone willing-to-pay above/below $x$
  - If $x < \bar{p}$ don’t change in high, serve low, good for all
  - If $x > \bar{p}$ serve all in high, drop price in low

$\implies$ Welfare increases every step
- More broadly, both distributions unimodal
- Distribution in weak below that in strong
- Always price on down slope of curve
  $\implies$ Increase in strong $\ll$ fall in weak
But one qualitative difference of perfect v. imperfect: distributive

- 1st degree transfers from consumers to producers
- But 3rd degree (and 2nd degree) distribute in consumers
- Often this much larger than transfer to the firm!
- Who benefits? The price-sensitive
- Price sensitive tend to be the poor, sick, elderly

⇒ Price discrimination powerful force for redistribution:
   1. University tuition and financial aid
   2. Student, elderly, educator discounts
   3. ATT subsidies to local loop
   4. Airline extraction from wealthy with classes
   5. Hospitals in favor of uninsured poor

⇒ Political ironies not usually understood
   - Left often backs redistribution, against price discrimination
   - Inconsistent, but right is the same!
Auctions and the monopoly problem

Common application of price discrimination is auction design

- Auctions very much like monopoly: set reserve price?
  1. Higher price means less sales, but higher price
  2. Only difference is opportunity cost of sale
     - Determined by other buyers’ willingness-to-pay

- Quantity is probability of sale, revenue is \( p [1 - F(p)] \)
  - \( F \) is cumulative distribution of values

- If marginal revenue decreasing, award to highest value
  - Marginal revenue is opportunity cost

- English auction a simple implementation of this
- But this assumes everyone has same marginal revenue!
- What if some sellers are more elastic?
  - This means they are expected to value less
  - Elasticity from distribution of values
Auctions, handicaps and 3rd-degree discrimination

Then you want to discriminate in favor of elastic buyers

- You can give them a “handicap”
- This forces others not just to beat them by a lot
- This is beneficial intuitively because?
  - Forces bidders with higher value to admit this
  - If he only had to win by little, he would just pay low value
  - But if he has to win by a lot you can get more out of him
  - Without such discrimination, uniform reserve for everyone!

- This sort of discrimination works exactly like standard
  1. Compared to no discrimination, lower overall reserve
     \[ \Rightarrow \] Those thought to have low values win more often when high
  2. High value bidders (inefficiently) win less often
     - But pay higher price, so profitable

- Ex: penalizing large buyers, minor sellers in spectrum