

ECN 453: Pricing and Price Discrimination 2

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Price discrimination: self-selection

- In the previous section we studied 'selection by indicators'.
 - To use selection by indicators, the seller needed information about the characteristics of consumers so they could offer different buyers different prices.
 - Often, sellers do not have much information about consumers.
 - e.g. if you're selling airline tickets online, not much information about who the high-value business travellers are.
- We will now discuss two types of **price discrimination by self-selection**.

Price discrimination: self-selection

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 - To use selection by indicators, the seller needed information about the characteristics of consumers so they could offer different buyers different prices.
 - Often, sellers do not have much information about consumers.
 - e.g. if you're selling airline tickets online, not much information about who the high-value business travellers are.
- We will now discuss two types of **price discrimination by self-selection**.
 - These are used when the seller has no information about the characteristics of consumers.
 - Instead, the seller offers different 'deals' which cause buyers to self-select into which group they belong to.

Plan

1. Price discrimination: self-selection by versioning
2. Price discrimination: bundling

Plan

1. **Price discrimination: self-selection by versioning**
2. Price discrimination: bundling

Self-selection: versioning

- **Self-selection by versioning:** offering different 'versions' of a product, each version targeted at a different group of consumers.
- Typical: a 'high-quality' version targeted at high-value consumers, and a 'lower-quality' version targeted at low-value consumers.
- **Examples:**
 - Discount airfares with date/destination restrictions
 - Iphone pro vs Iphone pro max
 - Different models of Amazon Kindle



Self-selection: versioning

- An extreme form of versioning: **damaged goods** - reduce the quality of existing products
- **Example:**



Figure: 2017 Tesla Model S full range:
\$76 thousand



Figure: Exactly the same car with a few
extra lines of code to restrict battery:
\$70 thousand

- Why would it be profitable for a seller to intentionally make some of its products worse?
Price discrimination.

Self-selection: versioning

- Another example of damaged goods (from textbook)
- 19th century French railcars: how to prevent wealthy passengers from choosing third-class tickets rather than second-class tickets?

Self-selection: versioning

- Another example of damaged goods (from textbook)
- 19th century French railcars: how to prevent wealthy passengers from choosing third-class tickets rather than second-class tickets?
- Answer: pull the roof off the third-class railcar!

Self-selection: versioning, example (p131)

- **Example:**

- Two versions of product: full and stripped-down. $MC = 300$ for both versions.
- Two types of consumers: 1 million people of type 1; 2 million people of type 2
- Willingness-to-pay of consumers:

	full	stripped-down
type 1 (high-end)	1500	800
type 2 (low-end)	600	500

- **Questions:**

- 1. Find the profit from selling only the full version for 1500.
- 2. Find the profit from charging 1500 for full version; 500 for the stripped-down version.
- 3. Find the profit from charging 1200 for full version; 500 for the stripped-down version.

Self-selection: versioning, example

- **Solution:**

- Idea: each type of consumer will self-select into the version with the highest consumer surplus (consumer surplus = willingness-to-pay - price).
- E.g. consumer 1 buys the full version if:

$$1500 - p_{full} \geq 800 - p_{stripped-down}$$

- 1. Find the profit from selling only the full version for 1500.
 - Consumer type 1 buys the full version (receiving CS=0)
 - Consumer type 2 does not buy anything (since their CS would be $600 - 1500 = -900$ from buying the full version).
 - Then, $Profit = (1500 - 300) \times 1 \text{ million} = \1.2 billion

Self-selection: versioning, example

- **Solution:**

- 2. Find the profit from charging 1500 for full version; 500 for the stripped-down version.
 - Consumer type 1: buys stripped down version ($CS=0$ from full version but $CS=800-500=300$ from the stripped-down version).
 - Consumer type 2: buys stripped down version ($CS=600-1500=-900$ from full version but $CS=500-500=0$ from the stripped-down version).
 - Then, $Profit = (500 - 300) \times 1 \text{ million} + (500 - 300) \times 2 \text{ million} = \600 million
 - Profit is actually less than in part 1 when we only offered the full version. Why? Consumer type 1 now chooses the stripped-down version.

Self-selection: versioning, example

- **Solution:**
- 3. Find the profit from charging 1200 for full version; 500 for the stripped-down version.
 - Consumer type 1: buys full version ($CS=1500-1200=300$ from full version but $CS=800-500=300$ from the stripped-down version).
 - Consumer type 2: buys stripped down version ($CS=600-1200=-600$ from full version but $CS=500-500=0$ from the stripped-down version).
 - Then, $Profit = (1200 - 300) \times 1 \text{ million} + (500 - 300) \times 2 \text{ million} = \1.3 billion
 - So, compared to Part 1, the seller is better off by \$100 million.

Self-selection: versioning

- Why are profits in Part 3 of the previous example higher than in Part 2?

Self-selection: versioning

- Why are profits in Part 3 of the previous example higher than in Part 2?
- The reason is that the prices in Part 3 ensured that the **high-end consumer had no incentive to go for the deal that was intended for the low-end consumer.**
 - Put another way, the prices in Part 3 of the example ensured that high-end consumers self-selected into buying the high-quality version, and low-end consumers self-selected into buying the low-quality version.

Self-selection: versioning

- We can make the self-selection idea more precise. Specifically, in order to get price discrimination by self-selection to work in the previous example, prices must satisfy the following constraints:
- 'Incentive constraints': (each consumer purchases the product that is designed for them)

$$\text{Consumer type 1: } 1500 - p_{full} \geq 800 - p_{stripped-down} \quad (IC1)$$

$$\text{Consumer type 2: } 600 - p_{full} \leq 500 - p_{stripped-down} \quad (IC2)$$

- 'Participation constraints': (price is not greater than the consumer's willingness-to-pay)

$$\text{Consumer type 1: } 1500 - p_{full} \geq 0 \quad (PC1)$$

$$\text{Consumer type 2: } 500 - p_{stripped-down} \geq 0 \quad (PC2)$$

Self-selection: versioning - additional comment

- Typically, we assume that if a consumer is indifferent between buying two products then they choose the product the monopolist would like them to.
- Specifically, this means (for example):
 - If the 'high-end' consumer is indifferent between buying the full version and the stripped-down version (i.e. they get the same consumer surplus from both types), they buy the full version.
 - Similarly, if the 'low-end' consumer gets consumer surplus $= 0$ for the stripped-down version, then they will still buy it.

Self-selection: versioning - cookbook steps to solve

- 1. Get the consumer surplus for each product, for each consumer:

$$\text{consumer surplus} = \text{willingness to pay} - \text{price}$$

- 2. For each consumer, find the product they buy by finding the product with the highest consumer surplus
- 3. Check that consumer surplus is not negative for the products that each consumer buys
 - this amounts to checking if the 'participation constraints' hold
- 4. Compute profits given consumer choices.

Self-selection: bundling

- **Bundling:** combining products and selling them together.

- **Examples:**

- Software is bundled as a 'suite'
e.g. microsoft office

- Cable tv channels

- Phone and internet plans

- Movie distribution

The figure displays three promotional cards for CenturyLink internet bundles, each featuring a different service provider's logo and a list of benefits. Each card includes a 'View Packages & Pricing' button and a 'Get' button.

- DISH:** Starting at \$64.99/mo for 24 mos. + taxes and RSN fee. Benefits include: 2-Year TV price guarantee, Access to 80K+ movies & shows on demand, Voice remote with Google Assistant, and Professional next-day installation.
- DIRECTV:** Starting at \$59.99/mo for 12 mos. + taxes and RSN fee. Benefits include: Shows and movies on demand, 155+ Channels, Free Genie HD DVR upgrade, and Undisputed leader in sports (Out-of-market games only).
- AT&T TV:** Starting at \$69.99/mo* for 12 mos. + taxes and RSN fee. Benefits include: The best of live TV & On Demand on all your favorite screens, Includes 40,000+ titles On Demand, and No annual contract.

Figure: Centurylink internet bundles

Self-selection: bundling, example p133

- **Example:** Three user types: writer, number cruncher, generalist. Two products: word processor, spreadsheet. Assume $TC = 0$.

User type	Number of users	Willingness to pay	
		Word processor	Spreadsheet
Writer	40	50	0
Number cruncher	40	0	50
Generalist	20	30	30

- **Questions:**
 1. What is the profit if each product is sold separately?
 2. What is the profit if each product is sold separately for \$50 and a bundle of the two products is offered for \$60?

Self-selection: bundling, example p133

- Main idea: each consumer will choose (i.e. self-select into) the product/bundle with the highest consumer surplus (= willingness-to-pay - price). We need to first find the optimal price and then find the profit.
- 1. What is the profit if each product is sold separately?
- **Solution:**
- The optimal price is to charge \$50 for the word processor and \$50 for the spreadsheet.
 - Here, writers choose the word processor (and generate profit = $50 \times 40 = \$2000$), and number crunchers choose the spreadsheet (generating \$2000), for total profit of \$4000.
- An alternative price is to charge \$30 for both products. But, this is not optimal.
 - Both writers and generalists will choose the word processor (generating $40 \times 30 + 20 \times 30 = \1800 from word processors). Similarly, \$1800 profit is made from selling the spreadsheet for a total profit of \$3600.
- (If it's not obvious, convince yourself that intermediate prices e.g. \$40 for both products, are not optimal.)

Self-selection: bundling, example p133

- 2. What is the profit if each product is sold separately for \$50 and a bundle of the two products is offered for \$60?
- **Solution:**
- Writers: choose the word processor (they could choose the bundle but they would be paying \$10 more for something they do not value). Profit from writers = $40 \times 50 = 2000$.
- Number cruncher: choose the spreadsheet (they could choose the bundle but they would be paying \$10 more for something they do not value). Profit from number crunchers = $40 \times 50 = 2000$.
- Generalists: choose the bundle (value the bundle at \$60, but would not want to buy a word processor or spreadsheet individually for \$50 since they only value each of these at \$30). Profit from generalists = \$1200.
- So, make \$5200 profit in total, and \$1200 more profit, from selling the bundle.

Self-selection: bundling, example p133

- Why did bundling increase profits in the previous example?

Self-selection: bundling, example p133

- Why did bundling increase profits in the previous example?
- By offering a bundle of the two products, the seller was able to:
 - get the generalist group to self-select into buying the bundle...
 - ...while still getting the writers and number crunchers to purchase products separately.
- This self-selection revealed to the seller the type of user.
 - The seller could then price-discriminate and charge a price equal to the willingness-to-pay in each group.

Self-selection: bundling, example p133

- Why did bundling increase profits in the previous example? (More on this...)
- In terms of the consumer valuations, the *negative correlation* in the valuations of writers and number crunchers for the products meant that these consumers did not buy the bundle (and so bundling worked as a price discrimination strategy).
 - For example, the writer loved the word processor but did not value the spreadsheet; the number cruncher loved the spreadsheet but did not value the word processor.
 - The generalist had a moderate valuation for each good and so bought the bundle.

Summary of key points*

- Price discrimination by self-selection is used when the seller does not have information about the exact characteristics of consumers.
- Versioning: Know how to compute the total profit (and potentially other things like consumer surplus, etc) given particular prices, using the consumer's self-selection choice.
- Bundling: Know how to compute the total profit (and potentially other things like consumer surplus, etc) given particular prices, using the consumer's self-selection choice.

*To clarify, all the material in the slides, problem sets, etc is assessable unless stated otherwise, but I hope this summary might be a useful place to start when studying the material.